

COMMENTARY

Hubris: The Recurring Pandemic

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ABSTRACT

The 2014 Ebola outbreak has been seen by many as a “perfect storm” and an “unprecedented” public health calamity. This article attempts to place this most current of epidemics, one currently struggling for pandemic status, in an historical frame. At least since the 1600s protocols and programs for the containment of epidemic disease have been known, and mapped. And yet it was almost six months after warnings about this epidemic were first sounded that incomplete programs of control and surveillance were instituted. In effect, we have forgotten the basics of what was once common knowledge in public health. Having placed our faith in bacteriology, virology, and pharmacology, we have forgotten the lessons learned, long ago. (*Disaster Med Public Health Preparedness*. 2015;9:51-56)

Key Words: pandemics, epidemics, geographic mapping, Ebola

The great pandemic is neither bacterial nor viral. It is instead pride and the arrogance of the new. We have placed our faith in genetics and molecular biology, believing they are equal to any microbial challenge. Once-common public health responses are ignored because we believe modern science will solve the problem. But when new epidemics strain toward pandemic status, our science can offer only future answers, not an immediate response. The latest viral invasion is an example of this. As the Ebola epidemic matured, threatening pandemic status, popular and technical reports promised as answers DNA sequencing¹ and untested drugs unavailable for distribution.²

There was a time when epidemic recurrences and pandemic diseases ruled—a time when plague, yellow fever, and cholera were recurrent visitors. At least as early as the late 17th century, protocols were in place to restrict the spread of epidemic diseases (then typically bacterial) while caring for persons in affected areas.

Comparing those early response programs to contemporary reactions to the Ebola epidemic can teach us a great deal about the epidemics we face today and surely will face tomorrow. Here futurity is important.

We are in a period of rapid microbial evolution. Old diseases (tuberculosis, for example) once tamed are returning in new and more virulent forms. Newly evolved bacteria and viruses are simultaneously appearing with extraordinary rapidity. Recent microbial incursions include, in a partial list, an alphabet soup of challenges: HIV/AIDS, the H1N1 and H5N1 influenzas, MERS (Middle East respiratory syndrome), SARS (severe acute respiratory syndrome), and WNV

(West Nile virus). Each presented an evolving health threat whose nature was at first unclear and whose unique patterns of diffusion were difficult to predict.³ From this perspective, Ebola is only one of a rapidly evolving class of microbial invaders.

PLAGUE

We have always lived in close relation, sometimes conflict, with members of the microbial world. Most microbes are benign and many are beneficial colonies we unthinkingly host in our bodies. But sometimes, and for a variety of reasons, bacteria and viruses become lethal, or at least toxic, sickening hosts who are hijacked as vectors for microbial advance. When that happens, the result is a local outbreak that, once firmly established, becomes a regional epidemic. From there pandemic always threatens.

The first great teacher was plague, a periodic challenge that stretched from the days of the Black Death,^{4,5} which helped end the Middle Ages, until the last pandemic at the end of the 19th century.^{6,7} Some suggest that this history provides a general model for public health reasoning and epidemic modeling.⁸ Most recent books and articles in this area, however, are primarily concerned with either identifying the genomic nature of the active plague bacillus⁸ or considering the sociology of local responses.^{9,10}

In the days before both bacteriology and virology, medical personnel and public officials energetically confronted plague outbreaks and epidemics. Authorities understood infectious outbreaks (including influenza and plague) as a public health problem.

By the 14th century, quarantine, which attempts to render infected persons harmless as disease carriers, was a broadly accepted form of medical prophylaxis.¹¹ By the 16th century, epidemic disease was understood as a dynamic threat whose vector was trade and travelers. For example, in Hans Holbein's 1538 *Dance of Death*, Plague is shown riding in the cargo holds of sailing ships when not sitting on the oxcarts of land-based travelers (Figure 1).¹² Nobody knew what plague was, but none doubted that it spread in towns and cities by humans and through the trade that was the lifeblood of evolving nations and nation states.

Absent the advantages of modern science, the approach to disease containment was spatial and multiscalar. First, there were local quarantines of families in households diagnosed with plague. Second, regions were quarantined to either prevent the introduction of plague from areas where it was active or to keep plague from spreading outward from active areas. Medical geographer Peter Haggett calls these, respectively, "offensive" and "defensive" programs of containment.¹³ It is this kind of

spatial thinking¹⁴ that has been degraded in recent years as a reflexive response to potential disease incursions.

BARI, ITALY: 1690S¹⁵

Both approaches were understood, and employed, at least as early as the 17th century when plague was a recurrent epidemic threat. During the plague years of 1690 to 1692, for example, Fillipo Arrieta instituted a detailed quarantine, surveillance, and support program in Bari, Italy.¹⁶ Using thousands of troops, his plan of attack—call it "military epidemiology"—was detailed in two maps and a text that are now housed at the library of the New York Academy of Medicine.

Arrieta understood the necessity of both defensive and offensive strategies to stop (or at least slow) the progress of plague while maintaining order in affected cities. His map shows an 80-kilometer long, defensive cordon sanitaire separating Bari, where plague was active, from neighboring provinces (Figure 2). The cordon is symbolized by a dotted line and flags, each representing the position of military posts whose soldiers prevented travel in or out of Bari Province. Along the coast, feluccas at sea similarly served the provincial quarantine program.

Within the province, Arrieta created a secondary cordon in the southeast portion of the province where plague was the most active. The walled area shown in the second map locates a dense compliment of troops (Figure 3); the density of flags reflects the strength of the action. Cities like Mola, where plague was active, were marked with a "B." Plague-free cities were marked with a "C." The goal was to act at both provincial and local scales to inhibit the invading microbe's ability to gain new territory. In military terms, Arrieta sought to cut the invading microbe's food chain by depriving it of new hosts at both local and regional scales of address.

Arrieta's response was comprehensive. As royal auditor he was charged with ensuring the general care and welfare of the people of his province. Thus, his report describes the need for care sites where those afflicted could be treated and burial sites for those who did not survive. He was also aware that it did no good to limit plague's reach if the persons in towns where plague was active were without food or medical support. Therefore, his report served to justify both the expense of the military campaign and simultaneously an urban program to maintain the life of townspeople whose necessities could not be ignored.

YELLOW FEVER AND CHOLERA

In the 18th century, recurrent epidemics of yellow fever were so severe they threatened the burgeoning trade between colonial Britain and its colonies. Indeed, the epidemics threatened the very existence of the colonies. "In 1793, approximately 10 percent of Philadelphia's population perished in an epidemic; in 1798, more than three thousand people died from the disease in a four month period in that

FIGURE 1

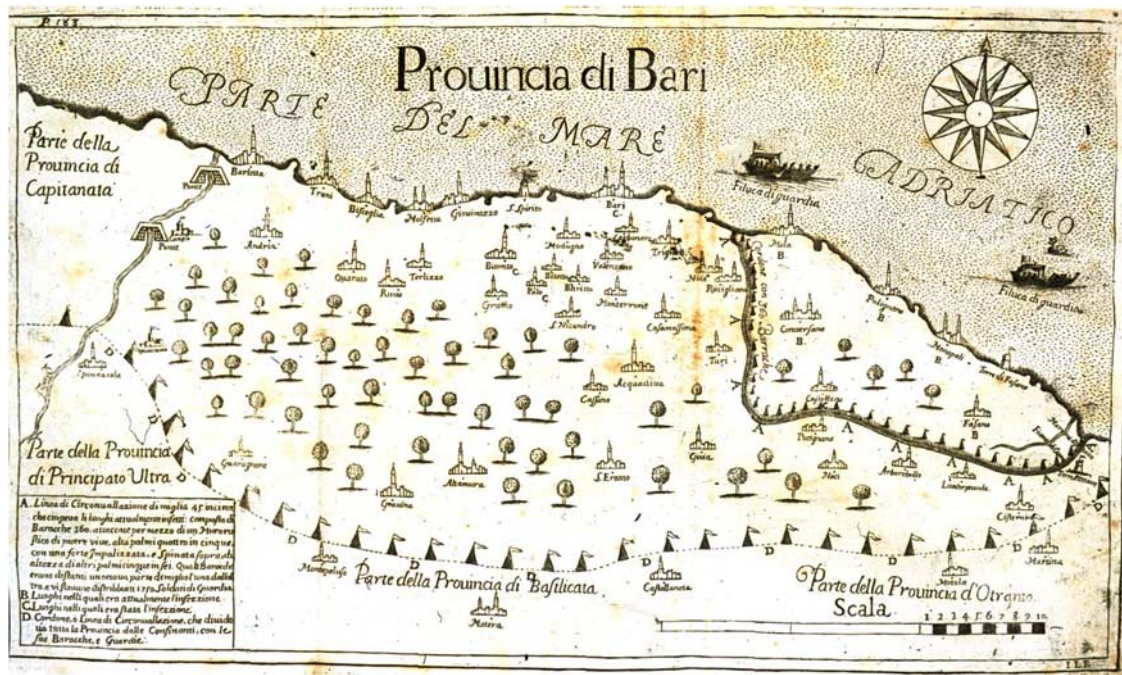
Dance of Death.



In Holbein's famous woodcut, he shows death, infectious disease, as something spread by travelers and their goods.

FIGURE 2

Bari map.



In 1694, administrator Filippo Arrieta published two maps that detailed a multi-stage containment plan designed to limit plague incursions in Bari, Italy.

FIGURE 3

Excerpt from the Bari map.



In this excerpt from Arrieta's second map, troop barriers are shown along the cordons. Towns where plague had been active, was active, and had yet to arrive were distinguished by different letters.

city.”⁹ The question was whether the disease was portable, transmitted by trading ships from the Caribbean, or was instead a result of the failure of public sanitation in the rapidly emerging industrial cities of America? If the disease was introduced by trade and travel, only quarantine would serve. If it was locally generated, however, trade could continue and attention could be focused on improving local sanitation.

In one of the first cases of “scientific” medicine published in a public journal, New York physician Valentine Seaman “proved” the local nature of the disease.¹⁰ Brilliant in its approach, his study was incorrect in its conclusions. Believing yellow fever a local, spontaneously generated disease caused by bad sanitation and resulting “bad airs,” the conclusion was that quarantine and containment need not be employed.

Similar questions about the origin and nature of a disease, and thus official responses to it, arose in the 19th century when cholera progressed from the British military encampments in India to the Middle East, Russia, and by the 1820s, to Europe.¹¹ While there was little doubt that this new “Asiatic cholera” was spread by human travel and trade,¹² British medical authors argued in *The Lancet* against quarantine or national programs of containment and care.¹³ Quarantine was, they insisted, a “savage” system that, in forcing a curtailment of trade, was worse than any disease it might seek to prevent. Restraint of trade could not be allowed. Public charity and general sanitation were offered instead as the nation’s palliatives. Between 1831 and 1834, over 50,000 Britons died as a result.

EBOLA

Ebola was first recognized in Sudan and Zaire in 1976 as one of a class of hemorrhagic fevers. Repeated local outbreaks received little international attention in subsequent decades. As late as 2012 they appeared to be rare, isolated events without general consequence.¹⁴ International officials paid little attention in March 2014 when increasing deaths were reported in Guinea. It was not until August 2014, when localized outbreaks matured into a full-blown epidemic affecting Liberia, Sierra Leone, Nigeria, and Uganda, that the world took notice but not action.

The World Health Organization continually monitored the progress of Ebola, reporting increasing mortality and new outbreaks on a regular basis. Effective responses were left to affected regions financially and politically unable to cope with the epidemic’s progression and severity. Aid was received in affected areas principally from international, nongovernmental organizations like Médecins Sans Frontières (Doctors without Borders). By September 2014 they, too, were overwhelmed by the spread of the disease.¹⁵

Into September 2014 there were neither national nor international attempts to create a coordinated response similar to Arrieta’s, to both isolate regions of viral activity (offensively or defensively) while assuring care in areas where Ebola was

active. In August 2014 international airlines began to voluntarily halt flights into affected areas. This informal program of offensive containment had the effect of reducing the supply of voluntary medical workers and necessary supplies to affected regions, thus exacerbating the crisis.¹⁶ In affected cities, local quarantines largely failed because they lacked the support those in affected areas required.

Why was there no concerted effort to contain Ebola in its early stages, to treat those affected in isolated outbreaks, or to mount an international effort at care and containment as the epidemic expanded and deaths increased? Why was there no plan, like Arrieta’s in Italy in 1694, to aggressively meet the microbial event head-on, and early?

DISCUSSION

By September 2014 commentators who themselves had been unconcerned with earlier outbreaks were insisting the Ebola epidemic was the result of if not racism, then a general disregard for the health of African peoples.¹⁷ They castigated wealthy nations for not aggressively supporting health interventions in affected countries and thus for the “perfect [epidemiological] storm” that resulted. But richer nations generally ignore isolated outbreaks of disease, even new diseases, in their own countries as well. There was no outcry, for example, when a new and virulent strain of tuberculosis evolved in the Skid Row slums of Los Angeles.^{18,19} Nor are Americans, or others, generally concerned with the incursion of a host of tropical diseases spreading across areas of poverty in the southern United States.^{20,21} Simply, we have assumed these localized outbreaks of evolving microbes will remain treatable by one or another modern drug. Where they are not, we pay little attention because they are isolated, localized, and thus the sole responsibility of local authorities.

This is hubris, perhaps, but not racism. It resides instead in the assumption—false but ingrained—that modern microbial scientists can defeat any public health threat as soon as it appears. Thus, we have come to assume the epidemic curve (an 18th century observation) of an evolving disease will be truncated simply by interventions at a local level. Microbial threats will remain a local phenomenon, not the springboard for an epidemic or pandemic threat. And yet, the progress of Ebola in 2014, local outbreaks that became regional and national epidemics, follows a well-understood pattern of infection that Arrieta well understood.²²

Our faith in modern science and its advanced pharmacologies has lulled us into thinking the old, activist model of an Arrieta is not needed. Alas, while experimental drugs show promise in combating current Ebola strains (evolving as they are), even if effective they will not be available for widespread distribution until the peak of the current epidemic curve in affected regions is well past.²³ Whether they can be deployed will depend upon their cost. The pricing of new drugs

patented by pharmaceutical companies is, today, the sole provenance of for-profit manufacturers.

Finally, the current epidemic emphasizes what was once well understood by the 18th and 19th century “sanitarians” like Valentine Seaman. Sporadic disease events become general disasters when societies fail to provide the basic necessities of public health: adequate housing, good nutrition, and health care. Containment may restrict the diffusion of this or that disease, but as sanitarians from Valentine Seaman to Edmund Chadwick insisted, disease and ill health are at the least “predisposing causes” bred within local communities and economies.²⁴ Ebola results, as do most infectious diseases, at the intersection of ecology and economy.²⁵

The conclusion, I believe, is clear. Disastrous medical situations result when once accepted basics of public health—economic and social—are ignored. Modern public health protocols have neglected, in the main, the social focus and political oversight that once dominated traditional responses to public health threats. Put another way, when facing the potential of epidemic disease, social epidemiology is public health. Early interventions to prevent outbreaks require not merely containment but attention to the social realities that promote disease generally.

Bacterial and viral evolutions are always encouraged by a well-understood set of conditions. These include urbanization in a context of accompanying deforestation that disturbs traditional ecologies. With urbanization typically comes poverty and income inequality, the result of which is the aggregation of vast groups of immune-suppressed persons in densely settled but poorly maintained cities. These in turn provide an ideal environment for the evolution of microbes displaced by urbanization, deforestation, and changes in traditional patterns of agricultural production. All of this occurs in the context of local, regional, and national travel and trade that ensure new vectors for evolving microbial strains.

From the perspective of the history of public health, Ebola is nothing new. It is instead the newest in a long line of microbial events responding to environmental changes and pressures induced by humans who are the principal vectors for their dissemination.

Disaster medicine results when the general necessities of public health (housing, nutrition, and medical care) are ignored in environments where traditional ecologies have been disturbed and human migration is active. The best of science will not be effective against a rapidly evolving bacterium or virus. To inhibit their evolution and their spread will demand that public health again be, as it once was, a socially active constituent of both medical science and political will. To ignore this activist perspective is to assume evolving microbial threats will remain safely distant from us

and that the lives of those affected are, somehow, of little consequence. The history of epidemics insists the first is a faint hope, rarely answered. Philosophy insists the second is a perspective that civilized persons cannot embrace.

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Published online: October 22, 2014.

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