The Bacteriological Era and its Aftermath: History, Ethics, and Implications

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THE BACTERIOLOGICAL ERA AND ITS AFTERMATH: HISTORY, ETHICS, AND IMPLICATIONS

1. INTRODUCTION

1.1 Overview

The culmination of the Sanitary Movement at the end of the 1850s provided an international impetus for cooperation in health matters. In time, this collaboration would produce an effective organization concerned primarily with the importance of international health problems.¹ Over the following two decades, international conferences were held in Paris, Constantinople, and Vienna, yet none yielded practical results. Despite their shortcomings, the meetings kept alive the criticality of international work in public health concerns. By the end of the nineteenth century, practical agreement in favor of international health was reached. Before any tangible progress could be made, however, greater apprehension of and agreement on the genesis and transmission on infectious diseases had to be secured. This vital achievement was accomplished through the development of fields such as bacteriology and immunology. This period of history, later termed “the Bacteriological Era” (BE), would have the most profound influence on public health from the end of the nineteenth century through the present day.²

1.2 Analytical Method

An increasingly blurred understanding of the past, present, and future of public health can richly benefit from an exploration of the history, ethics, and implications of the BE. To be sure, the issues of immediate import to the conversation over the historical manifestation of public health awareness in light of changing scientific, medical, and moral traditions is manifold, and any singular analysis of topics, no matter how sweeping, will unavoidably fall short of adequacy. This essay thus aims to briefly address the aforementioned three.³ It grounds its argument in two, straightforward premises: (i) the historical and ethical significance of the BE continues to inform and direct the contemporary global mission of public health; and (ii) robust and comprehensive public health exists to the extent that it is knowledgeable and complimentary of the historical and ethical insights gleaned from the BE. Drawing from this syllogism, the aim and proposal of this essay is such: to examine the history, ethics, and implications of the BE with the intention of positing the argument that the global mission of public health is attainable insofar as it is familiar with and honorific of the insights gleaned from the BE.

To secure the justification of this thesis, the essay will move in three parts. First, it will address the major historical developments in public health during the BE, including a specific analysis of (i) disease and germ theory, and (ii) surgery, bacteriology, and

¹. This newfound interdependence was sparked by the cholera pandemic of 1863. See George Rosen, A History of Public Health, expanded ed. (Baltimore: The Johns Hopkins University Press, 1993), 168-269; see especially pp. 266-69.
³. That is, history, ethics, and implications.
immunology. Second, it will address the ethical issues in public health during the BE, including a specific analysis of (i) the welfare of mothers and children, and (ii) the health and welfare of the worker. Finally, it will address the contemporary implications of the BE, including a specific analysis of (i) better medical care for the public, and (ii) raising public health awareness.

2. THE BACTERIOLOGICAL ERA: MAJOR DEVELOPMENTS IN PUBLIC HEALTH

2.1 Disease and Germ Theory

Outstanding among the BE’s victories is the virtual eradication of communicable diseases spread by water, milk, food, insects, and rodents. As a result, diseases such as yellow fever, typhoid fever, diphtheria, and malaria are a thing of the past in the United States. By virtue of its success, decades were added to the average human life span, thereby altering the age structure of the populous in dramatic fashion. These positive effects stem primarily from the demonstration toward the end of the nineteenth century that particular microscopic organisms (rather than noxious chemicals) produce infectious diseases. By the mid nineteenth century, however, the notion that infectious diseases are sustained in living particles was hardly novel. From antiquity, trained observers noticed that infectious diseases were transmitted by contagion and caused by “seeds,” “animalcule,” and “worms.” This idea had its genesis without the benefit of formal bacteriology, though some material progress was made even prior to germ discovery. By the second half of the nineteenth century, medical opinion slowly began to change in favor of this bacteriological view. This change was, to some extent, reactionary to the ineffectiveness of the miasmatic theory. More significantly, however, was evidence in favor of the idea that particular microorganisms caused contagious, epidemic diseases.

In 1854, Louis Pasteur remarked that in the realm of scientific observation, “chance only favors the mind which is prepared.” This comment encapsulates the primary element in Pasteur’s own work, which enabled him to explain the mysteries of fermentation, spontaneous generation, and ultimately contagious disease. By the 1870s, the investigations of Pasteur and others had partially identified the relationship between microbes and disease, but its underlying proof was not yet within reach. The rapid technological advances over the following to decades led to technical methods for the study of bacteria. Shortly thereafter, Pasteur would turn his attention to the inner-workings of infection and develop data pertaining to infectious disease prevention and treatment. Between 1980 and 1988, Pasteur began to research the modification of virulence in disease-producing germs. Following data procured by the Jennerian

vaccination,\textsuperscript{11} he formulated the hypothesis that infectious diseases were best prevented through vaccinations prepared from related disease strains. Most significant among Pasteur’s work was that on chicken cholera, swine erysipelas, and rabies. Each of these projects lead to the development of a robust immunology destined to profoundly impact the formulation of public health programs at the beginning of the twentieth century.\textsuperscript{12}

2.2 Surgery, Bacteriology, and Immunology

While Pasteur and others developed a foundation for the study of contagious diseases by identifying their derivative microbes, a young surgeon on the other side of the English Channel provided further support for the germ theory of disease by applying it to the prevention of wound infection. Prior to the mid nineteenth century, surgery was limited in two ways. Foremost among surgery’s problematic past was the almost inevitable occurrence of wound infection, which frequently resulted in fatal sepsis. The second factor was an inadequate means of managing pain. While the introduction of ether anesthesia would later render surgery painless, the terrible scourge of sepsis remained.\textsuperscript{13} In response to this epidemic, the surgeon Joseph Lister introduced antiseptic surgery.\textsuperscript{14} The antiseptic method of treating wounds would produce remarkable results. Bacteriological research was at last brought to bear on the problem of infection.\textsuperscript{15} Through the work of Lister’s peers on experimental septicemia in rabbits, the pathology of gunshot wounds, and the causatum of traumatic infectious diseases, it was proven that wound sepsis is linked to particular pathologic bacteria. These developments within the enterprise of bacteriology had important implications for public health practice, particularly in the detection and control of communicable diseases.\textsuperscript{16}

In the final decade of the nineteenth century, the remaining questions concerning disease contagion had been answered by identifying the specific causative organisms and through demonstrating how infection might be prevented.\textsuperscript{17} It became evident that a high degree of resistance to the causative organisms of such diseases could be produced by injecting those germs in either a reduced state, when dead, or by inoculation with remnants of the organisms. This became known as the principle of active immunization.\textsuperscript{18} The health benefit to the community was astronomical.\textsuperscript{19} In 1892, in a New York City laboratory, the new knowledge gained from bacteriology and immunology was first applied in public health practice. The discoveries of Pasteur and others were strategically applied to the protection and improvement of the community’s health.\textsuperscript{20} Despite varying rates of development, the public health laboratory service would pave the way for the

\textsuperscript{11} Rosen, A History of Public Health, 270-291; see especially p. 291.  
\textsuperscript{12} Rosen, A History of Public Health, 270-291; see especially pp. 290-91.  
\textsuperscript{13} Rosen, A History of Public Health, 291-312; see especially p. 291.  
\textsuperscript{14} Rosen, A History of Public Health, 291-312; see especially p. 292.  
\textsuperscript{15} Rosen, A History of Public Health, 291-312; see especially p. 293.  
\textsuperscript{16} Rosen, A History of Public Health, 291-312; see especially pp. 294-95.  
\textsuperscript{17} Rosen, A History of Public Health, 291-312; see especially p. 295.  
\textsuperscript{18} Rosen, A History of Public Health, 291-312; see especially p. 306.  
\textsuperscript{19} Primarily from the application of microbiological and immunological knowledge to the issues of disease control. See Rosen, A History of Public Health, 291-312; see especially p. 308.  
\textsuperscript{20} Rosen, A History of Public Health, 291-312; see especially pp. 308-09.
development of public health administration along more substantive lines than were previously possible.\textsuperscript{21}

3. THE BACTERIOLOGICAL ERA: ETHICAL ISSUES IN PUBLIC HEALTH

3.1 Welfare of Mothers and Children

A growing concern with all phases of pediatric development was a prominent feature of public health development during the BE. At the turn of the twentieth century, this welfare movement first became noticeable in the industrialized countries of western Europe and in the United States, and was directed toward general hygiene and disease prevention, as well as to dietary improvement and antipartum care.\textsuperscript{22} The moral motivation to place a high value on pediatric care could not afford to overlook the problem of infant morality and its causes. To this point, the causes were largely (though not exclusively) preventable, manifesting as instances of malnourishment, poor parenting, contaminated food, and factors related to poverty.\textsuperscript{23} Teaching mothers to care well for their children, the creation of clinics to facilitate this care, and the providence of clean milk were three critical elements that developed out of well-child services. The 1908 establishment of a Division of Child Hygiene in the New York City Health Department proved a landmark in the history of pediatric and maternal health.\textsuperscript{24}

Among the Department’s first accomplishments was employing milk distribution as a method of coming into contact with mothers to teach them proper child care. Attention was also directed to the conditions of infants in hospitals and to children of school age. Long before the notion of maternal deprivation was conceived, it became clear that good mothering is equally important for pediatric health as is good hygienic conditions in raising healthy children. During the same time, the significance of prenatal health also began to receive recognition in the United States. The first organized program was provided in 1908 by the Pediatric Department of New York Outdoor Medical Clinic. A year later, visiting nurse services were offered to pregnant women in Boston. By 1956, almost ninety-five percent of all (registered) live births took place within a hospital, and ninety-seven percent of all (registered) live births were attended by physicians. By the 1990s, expectant mothers averaged nine prenatal consultations with their physician. Public awareness of the moral value of maternity care combined with advances in medical knowledge have been responsible over the past fifty years with the sharp decline in both infant and maternal mortality as well as general improvement in their respective health.\textsuperscript{25}

\textsuperscript{21} Rosen, A History of Public Health, 291-312; see especially pp. 311-12.
\textsuperscript{22} Rosen, A History of Public Health, 325-40; see especially p. 325.
\textsuperscript{23} Rosen, A History of Public Health, 325-40; see especially pp. 326.
\textsuperscript{24} Rosen, A History of Public Health, 325-40; see especially pp. 332-33.
\textsuperscript{25} Rosen, A History of Public Health, 325-40; see especially pp. 338-39.
3.2 *The Health and Welfare of the Worker*

Moral concern with occupational health is of relatively recent origin in the United States. Seventy years ago, the field of industrial medicine was still unfamiliar ground to American medical professionals. Ignorance of workers’ diseases was often accompanied by scorn of the few physicians who endeavored to protect the professional health of the worker. Since 1910, health problems arising from exposure to noxious substances and hazardous working conditions have been recognized in numerous instances and effective measures have been taken to ameliorate such exposure.\(^{26}\) Moral concern over the well-being of workers has, of course, an important bearing on their status as producers within the workplace. On the other hand, poor working conditions affecting workers’ health also burden the community at large. The complexity and manifold consequences of lapses within adequate occupational health represents an important challenge to communities committed to public health as well as to groups dedicated to workers’ health as an indispensable element of community flourishing.\(^{27}\)

Throughout western Europe, occupational health and welfare of workers has long been the moral concern of several Ministries of Labor. This has been true of Germany, Norway, Sweden, Denmark, Finland, France, and Belgium. The evolutionary process of the United States on this front has differed, owing to the division of political and administrative responsibilities between the Federal government and the individual states. Moral concern for workers’ welfare in the United States came later than in Great Britain and the more industrialized European nations. However, several events, each occurring in 1910, gave evidence of rapid development in this area.\(^{28}\) A chief consequence of the workmen’s compensation movement, the laws enacted to protect the well-being of workers spanned from industrial accidents to, in most states, occupational diseases.\(^{29}\) The growing interest in relation to occupational health was also spawned by the appearance of another specialist: the industrial nurse, serving as a branch of public health nursing. Officially formed in 1942, the American Association of Industrial Nurses forged a movement to significantly improve the conditions of both home and factory life.\(^{30}\)

**4. THE BACTERIOLOGICAL ERA: IMPLICATIONS FOR TODAY**

4.1 *Better Medical Care for the Public*

Forty-five years ago, prepaid medical care hardly existed in the United States. In fact, the very principle of health insurance was still being debated. In 1932, the Committee on Costs and Medical Care published its *Final Report*, thereby providing the impetus for developing health insurance in America. While the issue of organization and distribution of medical services is hardly resolved, the implications of the BE on the need for provision of better medical care for the public are evident today. The rapid advance of medical science and the development of new diagnostic and treatment procedures have provided significant benefits for the ill and for the general public. However, the cost of medical care continues to be a major concern, especially for those without insurance. The implications of the BE on the effectiveness of medical care and the accessibility of healthcare for all citizens are critical issues that require urgent attention.


for adequate methods for providing medical care is vivid. To this point, the problem of the working poor and sick, accurately symbolized in the image of the pauper, occupied a strategic position in the social logic of centuries past. Previously in England, for instance, medical care for the sick poor was provided locally, often by parochial authorities. Some parishes were paid per individual attended to, others on a more general fee for service basis. Unfortunately, a system of this kind was bound to result in abuses. Nonetheless, one can both recognize and appreciate that even flawed medical care had a significant influence in shaping contemporary schemes for the provision of medical care.  

While the issue of national health insurance coverage in the United States is still enveloped in controversy, experiments in prepaid medical care were being conducted in various parts of the United States during the BE. In 1945, the Associated Medical Care Plans were created and incorporated as a trade association. This organization adopted Blue Shield as its symbol just as Blue Cross designated hospital insurance plans. From about 750,000 members in 1942, the Blue Shield Plan grew to almost 20 million by 1950. This attests to the considerable development and evolution of prepaid medical care in the United States during the BE, and represents the initial degree of protection against the heaviest costs of illness upon which the current system remains heavily dependent. However encouraging, this evidence also points to the need to remain vigilance on the local, community, state, and Federal level to coordinate with individuals and groups who promote public health. This alone can provide the necessary basis for obtaining the full potential of global health in modern medicine.

4.2 Raising Public Health Awareness

The past seventy years have witnessed unprecedented improvement in community and public health. However, these grand steps in the right direction have hardly been uniform, either within communities or between various countries. Several underdeveloped countries, including independent nations, continue to struggle with the problem of preventable disease. The concerns with which the countries of western Europe and the United States coped seventy-five years ago remain the same for many undeveloped countries today: infectious disease, the provision of uncontaminated water, proper sewage, and the elevation of the standard of living to a minimally acceptable level. To be sure, the work of public health awareness remains unfinished, as seen in the contexts of environmental sanitation, control of infectious diseases, health education, and

32. By 1935, the American Medical Association’s House of Delegates offered encouragement to local medical organizations to develop provisions of adequate medical services for all people, one able to adjust to the economic conditions of the time and meeting the costs of illness. See Rosen, A History of Public Health, 414-39; see especially pp. 437-38.
33. The significance of organized medical care was recognized by the public health profession by the American Public Health Associated with the formation of the Medical Care Section in 1948. See Rosen, A History of Public Health, 414-39; see especially pp. 437-38.
35. However, in the United States, Great Britain, and a number of countries in western Europe, the actual problems of public health are quite different. See Rosen, A History of Public Health, 462-71; see especially pp. 462-63.
even basic nutrition. Nevertheless, a newer set of problems has appeared, and it is with these that the community health programs of the next fifty years must grapple.\(^{36}\)

Within the last thirty years, as the problems of community health have begun to change, universities’ academic programs have also begun to reorient themselves to the future. The professionalization of public health as an independent discipline within medical scholarship has been enhanced by numerous developments.\(^ {37}\) Contemporary society is now in a position to look back and see the long road traversed in dealing with health problems and raising public health awareness throughout countless communities, both in the United States and abroad. While health problems persist today, communities are in a better position than ever to control their environment. Spurred by the BE, the contemporary goal of public health and its corresponding ethics is to achieve freedom from disease, want, and fear, and to thereby enhance and pass down the noble legacy that has become attainable at last.\(^ {38}\)

5. CONCLUSION

The aim and proposal of this essay has been to examine the history, ethics, and implications of the BE with the intention of positing the argument that the global mission of public health is attainable insofar as it is familiar with and honorific of the insights gleaned from the BE. To secure the justification of this thesis, it has drawn from the twofold premises that (i) the historical and ethical significance of the BE continues to inform and direct the contemporary global mission of public health, and (ii) robust and comprehensive public health exists to the extent that it is knowledgeable and complimentary of the historical and ethical insights gleaned from the BE. To this syllogistic end, the present essay has been successful.

REFERENCES


\(^{37}\) By 1949, a specialty board – the American Board of Preventative Medicine – was established so that medical professionals in the field of public health could stand alongside their physician colleagues on an equivalent basis of specialization. Moreover, by the end of the BE, a system of accreditation of schools of public health was developed under the auspices of the American Public Health Association. See Rosen, *A History of Public Health*, 462-71; see especially p. 470.