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HISTORICAL EPIDEMIOLOGY AND INFECTIOUS DISEASE PROCESSES IN AFRICA*

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Abstract
This article outlines the historical development in African studies of the sub-discipline of historical epidemiology and the contemporary challenges of understanding infectious disease processes that require integrating biomedical and historical knowledge. It suggests that Africanist historians can play a significant role in collaborative and multidisciplinary research in this field by exploring the histories of disease processes and interventions, and thereby contributing to improvements in public health practice and outcomes.

Key Words
Health, disease, historiography, HIV, AIDS.

The terrible mortality and morbidity crises of the AIDS epidemic, the concomitant spread of tuberculosis as an opportunistic infection, and the resurgence of malaria have given a heightened significance over the past decade to the study of infectious disease processes in Africa. The establishment of the Global Fund for AIDS, Tuberculosis, and Malaria in 2002, and the U.S. government’s creation of the President’s Emergency Plan for AIDS Relief and the President’s Malaria Initiative have raised the broader profile of African disease in the public health and biomedical sciences communities. The commitment to massive funding has allowed for large-scale interventions in AIDS and TB prevention and therapy, and efforts to control and eradicate malaria. Some of the interventions have produced unanticipated results, and this has led some specialists to a reconsideration of infectious disease processes in Africa.

This article is a brief introduction to the sub-discipline of historical epidemiology—the study of disease processes over time and space—in African studies. It discusses the historical development of this approach and the contemporary challenges of understanding infectious disease processes that require integrating biomedical and historical knowledge. It suggests that Africanist historians can play a significant role in collaborative and multidisciplinary research in this field by exploring the histories of disease processes and interventions, and thereby contribute to improvements in public health practice and outcomes.

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HISTORICAL EPIDEMIOLOGY

Historical epidemiology has its roots in observations about the environmental determinants of disease that have been associated with place. In the Western world, an approach known as medical geography developed in the late nineteenth century into an effort to catalog information about the past incidence and spatial distribution of disease. In the 1940s, as new biomedical understanding of infectious diseases began to transform the practice of medicine, the medical historian Erwin H. Ackerknecht inaugurated the modern sub-discipline of historical epidemiology in his efforts to integrate biomedical evidence in a field of social, economic, and environmental historical forces, and to investigate change over both time and space. This approach would be taken up by other historians whose research would transform historical perspectives on the history of Africa and its relation to the Atlantic world and make a persuasive case for the centrality of infectious disease processes in global history.

In the 1960s, Philip Curtin published two seminal articles, inaugurating the study of the history of infectious disease in Africa and the Atlantic world. The first, 'The white man's grave: image and reality, 1750–1850', explored European mortality along the coast of western Africa during the era of the Atlantic slave trade. The second, 'Epidemiology and the slave trade', explored the differential survival rates of African captives, who were drawn into the nightmare of the trans-Atlantic slave trade and subjected to the harsh labor regimes of plantation slavery in the Americas, as compared to those of European populations in the Atlantic world.

Using textual historical evidence, Curtin was able to calculate rates of morbidity and mortality and life expectancies for Africans and Europeans, and in so doing, he opened up new vistas for historical research in the Atlantic world. His research launched a process of integrating Africans and African history into the teaching of world history. The differential experiences of tropical African and European populations with malaria and yellow fever provided a biological foundation for understanding the economic logic of the Atlantic slave trade and for explaining the fact that Europeans had not colonized Africa south of the Sahara during the long centuries of the Atlantic slave trade. Later in his career, Curtin wrote other important articles on disease in Africa and two path-breaking books: a study of European mortality in the tropics in the nineteenth century, published in 1989, and a study of the significance of disease for Europeans who took part in the conquest of Africa, published

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2 E.H. Ackerknecht was a scholar with wide-ranging interests and competencies, and he made important contributions to the field of historical epidemiology. His seminal works include Malaria in the Upper Mississippi Valley, 1760–1900, supplement to the Bulletin of the History of Medicine, 4 (Baltimore, MD, 1945; rept., New York, 1977); and History and Geography of the Most Important Diseases (New York, 1963).
4 P.D. Curtin, 'Epidemiology and the slave trade', Political Science Quarterly, 83:3 (1968), 190–216.
in 1998. The overall impact of Curtin’s work in historical epidemiology was to highlight the epidemiological distinctiveness of the African disease experience and its significance for both African and world history.

In the 1970s, Alfred W. Crosby, Jr. and William H. McNeill employed an historical epidemiological approach to other large-scale disease processes in world history, and they transformed the way that world historians approach disease processes. In 1972, Crosby’s The Columbian Exchange: Biological and Cultural Consequences of 1492 made a powerful case for the impact of introduced Old World diseases in the Americas. His book transformed historical perspectives on New World population history, although he focused principally on Eurasian diseases that were introduced with great destructive impact during the early centuries of contact rather than on the African diseases brought to the New World. In 1976, McNeill wrote the first global history of disease. His celebrated work, Plagues and Peoples, devoted a chapter to Africa as the cradle of humanity, but the chapters that traced the disease experiences of human populations in eras after the first migrations of Homo sapiens from Africa focused principally on the experiences of Eurasian and Native American populations.

The studies in historical epidemiology by Curtin, Crosby, and McNeill focused on large-scale dynamics of disease transmission in specific historical contexts, and they concentrated on the period before the transformations in modern biomedicine. Their approaches were distinctively different from those undertaken by most historians of medicine or historians of science, in that they used contemporary biomedical knowledge retrospectively to interpret historical evidence.

In the 1970s, a small group of Africanist scholars began to explore the biomedical literature on African infectious diseases and to promote further research into the history of disease and medicine on the African continent. K. David Patterson published a bibliographic survey in the 1974 inaugural issue of the journal History in Africa, and in 1978 Patterson and Gerald W. Hartwig edited a volume of case studies entitled Disease in African History. This scholarship demonstrated that it was possible to reconstruct

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5 P. D. Curtin, Death by Migration: Europe’s Encounter with the Tropical World in the Nineteenth Century (New York, 1989); P. D. Curtin, Disease and Empire: The Health of European Troops in the Conquest of Africa (New York, 1998).


7 A. W. Crosby, Jr., The Columbian Exchange: Biological and Cultural Consequences of 1492 (Westport, CT, 1972).


10 G. W. Hartwig and K. D. Patterson (eds.), Disease in African History: An Introductory Survey and Case Studies (Durham, NC, 1978). The contributors to the volume drew upon the medical records created by colonial-era physicians, military officers, and plantation owners. They were able to explore the impacts of different epidemic and endemic diseases by virtue of the detailed biomedical evidence, and to chart and map the dynamics of the disease processes over time and space.
some disease processes that affected African populations within Africa, and it brought to light the fact that Eurasian diseases had been brought to Africa in the course of the eras of the slave trades and colonial conquests.

This perspective on the introduction of diseases to Africa was broadened by Helge Kjekshus, whose *Ecology Control and Economic Development in East African History* demonstrated the profoundly destructive consequences of the introduced diseases for African populations and their abilities to structure their environments in the chaos and tumult of the late precolonial and early colonial period. In the early 1990s, David Arnold published an important article entitled 'The Indian Ocean as a disease zone, 1500–1950' that explored the Indian Ocean disease environment and its influence on African disease experiences. It complemented the work of Crosby on the Atlantic basin, opening a window onto the African dimensions of this phase of global disease integration.

Beginning in the 1980s, a new generation of historians began to explore the history of disease processes and healing in Africa from more explicitly African-centered perspectives. Randall M. Packard’s accomplished study of tuberculosis in South Africa blended an understanding of biomedical knowledge with a political and economic analysis that unveiled the deleterious consequences of white rule on African health. Other Africanist scholars, in tandem with the rise to preeminence within the larger community of professional historians of the field of social history, worked to shed light on the African dimensions of health and healing and the political and economic forces that influenced the cultures of public health and medical intervention. This new social history of health and healing yielded a wealth of new perspectives for understanding African worldviews and practices. It took root at a moment of increasing international interest in African infectious diseases. This literature blossomed and found a readership in the field of African studies.

From the 1990s forward, most historians of African health and healing have focused their studies on the colonial period. The results have been rich and diverse. The new knowledge, however, has made few inroads into the study and practice of global public health. This is, in part, because Africanist historians, with few exceptions, have not been drawn to the key historical epidemiological questions: How have the African dimensions of health and healing influenced the transmission of disease? How have past experiences with disease and disease interventions influenced the present?

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14 The literatures on the political economy of health and the social history of medicine are large and nuanced, and lie well beyond the scope of this article.
In recent years, with the rising profile of African health issues, many undergraduate students with interests in African history have taken courses in public health and infectious diseases and some have had internships with non-governmental organizations (NGOs) in Africa that work in the field of public health. A few professional Africanist historians have taken advanced degrees in public health. These trends bode well for a mediation of the tension, felt by many among the older generations of Africanist historians, that the fields of historical study and biomedicine/public health are necessarily discrete and that engagements across this divide on the part of historians must necessarily be critical or even adversarial.

An increasing familiarity with the scientific evidence on the burden of diseases on sub-Saharan African communities may have a broader influence on the field of African studies. It may illuminate differently some of the broad tropes that have been used to describe meta-processes in the African past. For example, some approaches that consider capitalism, colonialism, and/or the policies of independent African states as disease processes may be strengthened, challenged, or complicated by a consideration of biomedical evidence.

Africanist research in historical epidemiology may also have significance for contemporary public health practice. By exploring the impacts of past interventions on the changing distribution and prevalence of diseases, it can help to reshape assumptions about present interventions. To date, interventionists have tended to assume that the technologies of intervention, organized around the control or eradication of individual diseases, could be more or less universally deployed, and there has seemed to be little need to understand local or regional historical context.15

At this time, the gulf between the biomedical sciences and the historical sciences in Africa is wide. It is in part an artifact of our organization of human knowledge in higher education. Students have been trained to specializations early in their undergraduate careers and away from an appreciation of the necessity for multidisciplinary training. In the biomedical sciences, in which technical advances have been rapid, the scientific practices and the medical interventions of the past have seemed to hold little meaning. The public health specialists who deploy the new biomedical technologies have not been trained to weigh the consequences of past interventions.

The failure of the first generation of HIV interventions, based upon public health experiences in the Western world, forced a rethinking of these divisions in human knowledge. Some historians immersed themselves in the scientific literatures and made important contributions that found readerships in both social science and public health fields. One of the most successful is John Iliffe, who read deeply in the microbiological and anthropological literature on HIV. He produced a masterpiece of synthesis on the history of the AIDS epidemic in Africa that has been one of the gateways into AIDS studies for a new generation of public health specialists.16

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The multidisciplinary challenge of understanding infectious disease processes is also a formidable challenge for biomedical scientists. Some have come to understand the central importance of incorporating African social and cultural realities into their models and have made crucial contributions to contemporary disease control. African physicians in Uganda, for example, insisted that the issue of concurrency in sexual relationships was critically important to HIV transmission and insisted that it be included in epidemiological modeling. The microbiologist and science writer Helen Epstein brought this issue to a broad audience, exposing the profoundly Eurocentric biases that underlay the epidemiological modeling of the dynamics of sexually transmitted diseases.17

Investigations into the history of disease control in Africa are just beginning, and there is an array of different kinds of challenges to be met. The molecular studies of the emergence of various infectious diseases have presented historians with new evidence to contextualize. For example, the hemoglobin mutation known as Duffy antigen negativity, which is very widely expressed in West and West Central African populations and makes the bearer unable to be infected with the malaria parasite *Plasmodium vivax*, apparently emerged many thousands of years ago. It is probably best understood as a response to a heavy burden of vivax malaria infection and thus is probably evidence of a hitherto unsuspected first chapter in the history of infectious disease.18 Molecular evidence is being developed that will shed light on the history of many other infectious diseases, and it is likely that the interpretive structures that have been advanced by bench scientists will benefit from correctives and reframings by professional historians.

Most of the important infectious disease processes in Africa are rooted in both ecological and social historical processes. Africanist historians have made major contributions to the understanding of disease in the colonial period, drawing upon an earlier era of medical evidence and recorded practice.19 Some are now taking on the challenge of framing and interpreting contemporary disease processes. The companion essay by Tamara Giles-Vernick, Ch. Didier Gondola, Guillaume Lachenal, and William Schneider explores some of the problematic assumptions about the role of African historical ecological and social patterns and processes in the emergence of the HIV epidemic. The correctives that historians offer have implications that may alter the use of the trope of ‘emerging infectious diseases’ in the biomedical literature.

Some of the most important infectious diseases are of long-standing, and investigations of earlier efforts at disease control may produce valuable insights. For example, it is frequently stated in the scientific literature that Africa was excluded from the global malaria eradication program (GMEP) promoted by the World Health Organization (WHO) from 1955–69 that employed indoor residual spraying with synthetic insecticides such as DDT and experimented with greater access to therapeutic drugs such as chloroquine. Yet during the era of the GMEP, the WHO ran malaria eradication pilot projects in a variety of ecological zones throughout tropical Africa in an effort to develop eradication protocols that

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could stop malaria transmission. The WHO published an ‘Africa Malaria Eradication Yearbook’ in 1959 and 1960 that catalogued the successes and looked forward to ‘scaling-up’ the projects across the continent. It was only in the early 1960s, when it became clear that the interventions could not fully interrupt malaria transmission, that the WHO bowed to epidemiological realities: the available tools for the interruption of malaria transmission were insufficient to eradicate malaria; the extensive use of synthetic insecticides would select for insecticide-resistant mosquitoes; and the extensive use of synthetic antimalarial drugs would select for drug-resistant parasites. In the contemporary campaign, many of the same tools are being deployed. The historical experience is a critical one, because the early successes of the pilot eradication programs compromised the acquired immunity of the African populations in the ‘protected’ zones, and when the projects ended, the populations were subject to epidemic malaria.  

Historical epidemiological studies will also likely allow for new understandings of infectious disease processes by situating them in the context of ecological processes. For example, the powerful forces of biome conversion, forced resettlement, and urbanization have long altered the conditions in which infectious diseases can be transmitted, and depending upon the pathogen these forces may have amplified or suppressed transmission. As examples, one might note that the processes of rapid urbanization have concentrated a demand for bush meat in the cities, and thereby increased the prospects for the introduction of pathogens from their wild animal hosts. Refugee camps, without adequate provisions for the treatment of human waste, have facilitated the transmission of diseases transmitted by a fecal-oral route, and cholera has thereby become an endemic disease in Africa. The pollution of water sources in some of the major peri-urban areas has reduced the transmission of malaria—because the vector mosquitoes need clean water in which to breed—while at the same time augmenting water-borne pathogens and generating a ‘toxic fringe’ around the cities.

Yet another fertile field of inquiry will be the impacts of the various disease control interventions on broader ecologies. The current malaria control campaigns, for example, are operating in an environment that has been significantly altered by the GMEP campaign. The earlier campaign’s use of synthetic insecticide selected for alleles in the vector mosquitoes that provide resistance to the synthetic insecticides, and it is possible that the mix of vector mosquitoes was significantly altered by the disease control interventions. Indoor residual house spraying—and during the contemporary campaign, insecticide-treated bed nets—produced heavy selection pressure on indoor-biting mosquitoes and may have forced the evolution of outdoor-biting anopheline mosquitoes.  

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22 Recently, researchers have discovered a hitherto unknown ‘cryptic subspecies’ of anopheline mosquito in Burkina Faso. Although the significance of the role of the recently discovered mosquito in malaria transmission has not been established, if it is shown to be a significant vector, this would represent a significant challenge to the contemporary malaria control and elimination campaigns; see M. M. Riehle et al., ‘A cryptic subgroup of Anopheles gambiae is highly susceptible to human malaria parasites’, Science, 331:6017 (2011), 596-8.
epidemiological studies will provide new ways of understanding the biological constraints under which contemporary disease control projects are working. A concomitant impact may be felt in the field of ecological studies, as it becomes evident that the ecological worlds in which the campaigns operate are themselves, in part, the artifacts of past interventions.

The epidemiological modeling of malaria transmission has likewise taken little account of the relationships between past public health and medical interventions, and their reception by African populations or by major processes of anthropogenic change such as conversion of habitat (for example, from rainforest to plantation cropping or coastal wetland to urban settlement), shifting agro-economic practices, climate change, and urbanization. In some of these subfields, Africanist historians have made significant contributions—notably in understanding past environmental and agro-ecological change.23 The integration of this knowledge into contemporary epidemiological modeling will produce more realistic and less idealistic programmatic recommendations.

In short, there is much to do. The biomedical understandings of disease processes in Africa are frequently naive, because they lack political, social, cultural, and economic historical contexts. Africanist historians can develop these historical contexts in ways that will be relevant to the practice of public health in Africa. This may involve a broadening of the professional identities of those historians who choose to work in this field of applied historical epidemiology. The venues for publication of this multidisciplinarily informed knowledge are in the biomedical literature, in which influential publications are usually in the form of articles rather than books, as well as in the historical literature.

The rapid growth and increasing complexity of the biomedical sciences since the mid-twentieth century present an array of challenges for those who wish to understand infectious disease processes in Africa. Those trained in the biomedical sciences are hard pressed to keep up to date with new findings in their fields of specialization, and they rarely have the time, inclination, or skills to work beyond them. Africanist historians are challenged to become conversant, to synthesize, and to draw new meanings from a large volume of research studies. Some will be well placed by virtue of their multidisciplinary training in the social and historical sciences to do so.

The importance of this work in historical epidemiology extends beyond the academy. It can raise new issues to be incorporated into disease interventions. It can inform contemporary public health planners about the consequences of past interventions. These temporally deeper analyses may eventually reshape the general assumptions and models of infectious disease processes that now guide public health interventions.

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23 See, for example, R. M. Packard, *The Making of a Tropical Disease: A Short History of Malaria* (Baltimore, MD, 2007). Other important work is in progress. The Rockefeller Foundation has funded a project to investigate the relationship between the introduction of hybrid maize and outbreaks of malaria in highland Ethiopia. Over the course of five years of research, a multidisciplinary team of researchers has produced a wealth of information that casts new light on epidemiological assumptions about ecological continuity over time. James C. McCann, Anthony Kiszewski, and Richard Pollack, personal communications with the author, 15–16 December 2011.