HANDBOOK OF MEDICAL SOCIOLOGY

Sixth Edition

Chloe E. Bird, Peter Conrad,
Allen M. Fremont,
and Stefan Timmermans
Editors

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Health, Security, and New Biological Threats

Reconfigurations of Expertise

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In recent decades, a series of new biological threats has raised both technical and political questions about how to understand and manage disease risk. In this chapter we explore what role the social studies of medicine can play in analyzing these new disease risks. We focus in particular on recent critical scholarship that has examined how existing forms of biomedical and security expertise are being reconfigured in response to new threats such as emerging infectious disease and bioterrorism.[1] This work provides insight into how disease threats are being "problematized," and therefore it helps us diagnose some of the political, ethical, and technical conflicts that have arisen in response to new or newly perceived threats to health.

The chapter begins with an introduction to the issue of securing health as a problem for expert practitioners, and suggests how new disease threats cut across existing fields of expertise and authority. We then look at several domains in which new biological threats have been identified by public health experts, policy makers, and other public authorities: emerging infectious disease, bioterrorism, the life sciences, and food safety. In the third section we describe recent work in the social studies of medicine that has analyzed the new configurations of authority and expertise that have emerged in these domains. In the conclusion we reflect on the role of the critical, reflexive knowledge produced by the social studies of medicine in approaching this terrain.

Biosecurity Interventions

The World Health Organization's (WHO) annual world health report for 2007, *A Safer Future: Global Public Health Security in the 21st Century*, began by noting the success of public health measures during the twentieth century in dealing with great microbial scourges such as cholera and smallpox. But in recent decades, it continued, there had been an alarming shift in the "delicate balance between humans and microbes." A confluence of factors—demographic changes, economic development, global travel and commerce, and conflict—had "heightened the risk of disease outbreaks," ranging from new infectious diseases such as HIV/AIDS and drug-resistant tuberculosis to food-borne pathogens and bioterrorist attacks (WHO 2007, 1).

The WHO report proposed a framework, "public health security," for responding to this new landscape of threats that is striking in its attempt to bring together previously distinct technical problems and political domains. Some of the biological threats discussed in the report—particularly the use of bioweapons—have

traditionally been taken up under the rubric of national security and approached by organizations concerned with national defense. Others, such as infectious disease, have generally been managed as problems of public health, whose history, though certainly not unrelated to conflict and military affairs, has been institutionally distinct (Fearnley 2008; King 2002).[2] The WHO proposal also sought to reconfigure existing approaches to ensuring health. The report emphasized a space of "global health" distinct from the predominantly national organization of both biodefense and public health. "In the globalized world of the 21st century," it argued, simply stopping disease at national borders is not adequate. Nor is it sufficient to respond to diseases after they have become established in a population. Rather, it is necessary to prepare for unknown outbreaks in advance, something that can be achieved only "if there is immediate alert and response to disease outbreaks and other incidents that could spark epidemics or spread globally and if there are national systems in place for detection and response should such events occur across international borders" (WHO 2007, 11). According to WHO, then, a functioning global health security apparatus would have to focus on preparing for catastrophic disease outbreaks anywhere in the world.

The WHO report is one among a range of recent proposals for securing collective health against new or newly recognized biological threats. Other prominent examples include the recent Pandemic and All-Hazards Preparedness Act in the United States, reports on "global biological threats" from prominent think tanks such as the RAND Corporation, new research facilities such as the National Biodefense Analysis and Countermeasures Center, and ambitious initiatives such as the Global Fund to Fight AIDS, Tuberculosis, and Malaria, and the President's Emergency Plan for AIDS Relief. These proposals build on a growing perception among diverse experts and officials—life scientists and public health officials, policy makers and security analysts—that new biological threats challenge existing ways of understanding and managing collective health and security. From the vantage point of such actors, the global scale of these threats crosses and confounds the boundaries of existing regulatory jurisdictions. Moreover, their pathogenicity and mutability push the limits of current technical capacities to detect and treat disease. And the diverse sources of these perceived threats—biomedical laboratories, the industrial food system, global trade and travel—suggest a troubling growth of modernization risks that are produced by the very institutions meant to promote health, security, and prosperity. In response, proposals for new interventions seek to bring various actors and institutions into a common strategic framework.

An initial aim of this chapter is to map this emerging field of biosecurity interventions. As we use the term here, "biosecurity" does not refer exclusively—or even primarily—to practices and policies associated with national security, that is, to defense of the sovereign state against enemy attack. Rather, we refer to the various technical and political interventions—efforts to "secure health"—that have been formulated in response to new or newly perceived pathogenic threats. In examining these interventions, we do not focus on the character of disease threats per se, or on the social factors that exacerbate disease risk, but rather on the forms of expertise and the practices of intervention through which new disease threats are understood and managed. Thus, we describe interactions among the diverse experts and organizations that are being assembled in new initiatives to link health and security.[3] These include public health officials, policy experts, humanitarian activists, life scientists, multilateral agencies such as WHO, national health agencies such as the Centers for Disease Control (CDC), national security experts, physicians, veterinarians, and government officials. We have selected several recent case studies of settings in which biosecurity interventions are being articulated. This research indicates that expert approaches to new biological threats remain unsettled: "biosecurity" does not name a stable or clearly defined approach, but rather a number of overlapping and rapidly changing problem areas.

Domains of Biosecurity

The current concern with new biological threats has developed in at least four domains: emerging infectious disease, bioterrorism, the cutting-edge

life sciences, and food safety. The first of these domains, emerging infectious disease, initially drew the attention of public health experts in the late 1980s in response to the AIDS crisis, the appearance of drug-resistant strains of tuberculosis and malaria, and outbreaks of new diseases such as Ebola virus (King 2002). Alarm about these disease threats emanated from various quarters, including scientific reports by prominent organizations such as the Institute of Medicine (1992), the reporting of science journalists such as Laurie Garrett (1994), and the scenarios of novelists such as Richard Preston (1997). For many observers, the emerging disease threat—particularly when combined with weakening public health systems—marked a troubling reversal in the history of public health. At just the moment when it seemed that infectious disease was about to be conquered, and that the critical health problems of the industrialized world now involved chronic disease and diseases of lifestyle, experts warned that we were witnessing a return of the microbe (Anderson 2004). This judgment seemed to be confirmed in ensuing years by the appearance of new diseases such as West Nile virus and SARS (severe acute respiratory syndrome), by the intensification of the global AIDS crisis, and by the unexpected resurgence of diseases such as tuberculosis and malaria. After considerable delay, we have recently seen the implementation of large-scale responses to these new infectious disease threats by governmental, multilateral, and philanthropic organizations.

A second domain in which biological threats have received renewed attention is in response to the prospect of bioterrorism. In the wake of the Cold War, U.S. national security officials began to focus on bioterrorism as one of a number of asymmetric threats. These officials hypothesized an association between rogue states, global terrorist organizations, and the proliferation of weapons of mass destruction (Alibek and Handelman 1999; Guillemin 2005; Miller, Engelberg, and Broad 2001). Revelations during the 1990s about Soviet and Iraqi bioweapons programs, along with the Aum Shinrikyo subway attack in 1995, lent a sense of credibility to calls for biodefense measures focused on bioterrorism. Early advocates of such efforts, including infectious disease experts such as D. A. Henderson and national security officials such as Richard Clarke, argued that adequate preparation for a biological attack would require a massive infusion of resources into both biomedical research and public health response capacity.[4] More broadly, they claimed, it would be necessary to incorporate the agencies and institutions of the life sciences and public health into the national security establishment. The anthrax letters of 2001 intensified this demand for new biosecurity initiatives. The eventual success of the campaign is reflected in the exponential increase in total U.S. government spending on civilian biodefense research between 2001 and 2005, from $294.8 million to $7.6 billion.[5]

Third, developments in the cutting-edge life sciences have generated new concerns about the proliferation of technical capacities to create lethal organisms, for example, in fields like synthetic biology that promise dramatic advances in techniques of genetic manipulation (Garfinkel et al. 2007). Security experts along with some life scientists worry that existing biosafety protocols, which focus on material controls in laboratories, will not be sufficient to prevent intentional misuse as techniques of genetic manipulation become more powerful and routine, and as expertise in molecular biology becomes increasingly widespread. As a result, a number of new biosafety regulations have been imposed on research dealing with potentially dangerous pathogens. Meanwhile, intensive discussions about how to regulate the production of knowledge are underway among policy planners, life scientists, and security officials; and lawmakers have put in place new oversight mechanisms such as the National Science Advisory Board for Biosecurity.

Fourth, and with more pronounced effects in Europe than in the United States, a series of food safety crises has sparked anxieties about agricultural biosecurity and the contamination of the food supply. In Europe, outbreaks of BSE (bovine spongiform encephalopathy, known also as mad cow disease) and foot-and-mouth disease in the 1990s drew attention to the side effects of industrial meat production. In the wake of these outbreaks, controversies raged both about the failures of the regulatory system in detecting new pathogens and about the mass culling

measures that were mobilized in response. Also in Europe, environmental activists put the problem of regulating genetically modified organisms at the top of the political agenda. In the United States, meanwhile, public outcry over food safety has been provoked by outbreaks of *E. coli* and by the presence of sick animals in the food supply, which led in early 2008 to the largest beef recall in the history of the meat industry.

In each of these domains, a series of events has turned the attention of policy makers, health experts, civic groups, and the media to new biological threats. At one level, these may usefully be seen as "focusing events" in Thomas Birkland's (1998) sense: they have raised public awareness of threats to health, and catalyzed action on the part of governments and other actors. However, it is important to underscore that the meaning of such focusing events is not self-evident; indeed, these events are characterized by substantial ambiguity. In all of them, we find that health experts, policy advocates, and politicians have competing visions about how to characterize the problem of biosecurity and about what constitute the most appropriate responses. Thus, we should ask of these events: what *kind* of biosecurity problem are they seen to pose, what techniques are used to assess the problem, and how are diverse responses justified?

In this light, it is worth examining more closely how these new or newly perceived threats to health have been "problematized" (Foucault 1994). This mode of analysis asks how a given event or situation has been constituted as an object of thought—whether through moral reflection, scientific knowledge, or political critique.[6] Such an approach, when turned to the field of biosecurity, makes neither broad prescriptions for the improvement of health and security, nor blanket denunciations of new biosecurity interventions. Rather, it examines how policy makers, scientists, and security planners have constituted potential future events as biosecurity threats, and have responded by criticizing, redeploying, or reworking existing elements.

Recent work in the critical studies of health and security indicates some of the ways in which the field of biosecurity is being problematized today. On the one hand, these studies examine the different *normative frameworks* through which the problem of biosecurity is approached: national defense, public health, or humanitarianism, for example. On the other hand, they examine the *styles of reasoning* through which uncertain threats to health are transformed into risks that can be known and acted upon: public health practices based on cost-benefit analysis, preparedness strategies that emphasize the mitigation of vulnerabilities, or precautionary approaches that seek to minimize catastrophic risk.[7] And these studies indicate how, in fields such as public health and biomedical research, expert frameworks are being reconfigured in relation to new problems of health and security. As we will see, tensions and conflicts over normative frameworks arise when existing apparatuses for managing threats to health no longer seem to work, and new ways of taking up problems are emerging.

New Intersections of Health and Security

Public Health Preparedness

We first turn to research on the encounter of traditional public health organizations with current demands for preparedness against catastrophic threats. At this conjuncture of different normative frameworks—"public health preparedness"—an existing set of practices, understandings, and institutions has been reconfigured as experts perceive and respond to new microbial threats.

The field of public health developed in the nineteenth century as a new way to understand and manage infectious disease (Coleman 1982; Rosen 1993).[8] In contrast to prior understandings of epidemics as unexpected and unpredictable misfortunes that beset human communities from without, early public health efforts traced disease to the immanent properties of the social field—sanitation practices, water supplies, forms of habitation and circulation—using statistical analysis of the incidence and severity of disease events across a population over time (Rabinow 1989; Rose 1999). Public health also provided an approach to evaluating responses to disease outbreaks in a population. For example, as historian George Rosen has noted, beginning in the early

nineteenth century statistical techniques were used to evaluate inoculation strategies by weighing the probability of disease outbreaks against the probability of adverse effects from inoculation (Foucault 2007; Rosen 1993). Such cost-benefit analyses became the norm for assessing public health interventions. Historians of public health have documented a second key point of inflection: the bacteriological revolution of the late nineteenth century, at which point the "social" form of public health was confronted with a more technically oriented set of interventions focused on pathogen eradication (Fee and Porter 1992; Tomes 1998). The eradicationist orientation toward infectious disease reached its zenith with the global smallpox and polio campaigns of the 1960s and 1970s.

Public health institutions consolidated after World War II, but simultaneously, in parallel domains such as biodefense, experts began to recognize possible limits to the public health approach to microbial threats. Thus, Lyle Fearnley has shown that in the United States after World War II, as officials perceived existing infectious diseases to be successfully managed, biodefense experts, concerned about bioweapons attack, began to conceptualize outbreaks of infectious disease as anomalous events—that is, novel occurrences about which historical data do not exist, and about which little is known (Fearnley 2005b). And yet, well into the post–World War II period, techniques had not been established for assessing or managing such uncertain disease events. Thus, in responding to a possible swine flu epidemic in 1976, U.S. public health authorities did not have a paradigm for managing a future event whose likelihood and consequence were unknown, and therefore had a difficult time agreeing on appropriate response measures—for example, whether to undertake mass vaccination of the population (Lakoff 2008).

In recent decades, newly perceived threats to health—including bioterrorist threats such as a smallpox attack and emerging infectious diseases such as highly pathogenic avian influenza—have placed greater pressure on public health departments and national security officials to develop an approach to disease events not easily managed through the traditional tools of public health. One prominent response to these new threats has been the articulation of preparedness practices among local public health jurisdictions in the United States—practices that have migrated from the national security and disaster management fields (Schoch-Spana 2004). In contrast to traditional public health practice, health preparedness does not draw on statistical knowledge of past events in order to design interventions. Rather, it employs imaginative techniques of enactment such as scenarios, exercises, and analytical models to simulate the occurrence of uncertain future threats.[9] The aim of such techniques is not to manage known disease but to address vulnerabilities in health infrastructure by, for example, strengthening hospital surge capacity, stockpiling drugs, exercising response plans, and vaccinating first responders. Such techniques of preparedness often do not provide a clear basis for cost-benefit analysis. Rather, they are aimed at developing the capability to respond to various types of potentially catastrophic biological events.

Calls for public health preparedness in the United States have escalated in recent years as public health institutions faced mounting concerns about, first, a possible bioterrorist attack and then, beginning in 2005, a devastating influenza pandemic. The U.S. Congress's 2006 Pandemic and All-Hazards Preparedness Act delegated a number of new health preparedness functions to local and national public health authorities. According to a group of biosecurity analysts, the legislation marked "a major milestone in improving public health and hospital preparedness for bioterrorist attacks, pandemics, and other catastrophes and for improving the development of new medical countermeasures, such as medicines and vaccines, against biosecurity threats" (Mair, Maldin, and Smith 2006). Preparedness has thus become a crucial interface between public health and national security.

But increased attention to and funding of health preparedness by no means implies consensus around a single approach. The existing institutions of public health are not easily reconciled with the new demands and norms of health preparedness, and there is considerable disagreement about the most appropriate way to achieve preparedness. One question is whether preparedness

measures should focus on specific interventions against known agents such as anthrax and smallpox, or instead on generic measures that would be effective against currently unknown pathogens (Brent 2006; Fearnley 2005a). Another debate among experts surrounds the "dual use" potential of biodefense measures. Advocates of increased health preparedness argue that even in the absence of a bioterrorist attack, resources spent on strengthening public health infrastructure will be useful for managing other unexpected events, such as the outbreak of a "naturally" occurring infectious disease. However, the ideal of dual use faces many difficulties, in part because public health professionals often do not agree with security experts about which problems deserve attention, and how interventions should be implemented.[10] Such disagreements point to broader tensions provoked by the current intersection of public health and national security. Public health officials and national security experts promoting preparedness strategies often have very different ways of evaluating threats and responses. Critical studies of public health preparedness demonstrate some of the tensions that develop at this intersection.

We can take, as an example, the 2002–2003 Smallpox Vaccination Program, which has been studied by Dale Rose (2008). The Smallpox Vaccination Program, whose goal was to vaccinate up to ten million first responders, was initiated, in part, in response to the imaginative enactment of a catastrophic event. A June 2001 scenario-based exercise called "Dark Winter" convinced officials that the United States was highly vulnerable to a smallpox attack. This focus on smallpox intensified in the run-up to the second Iraq war, as Bush administration officials worried that Iraq might retaliate against a U.S. invasion with a smallpox attack in the United States. The vaccination campaign, Rose notes, was meant to "take smallpox off the table" as a threat to national security.

But here a problem arose around conflicting styles of reasoning—as well as conflicting political positions. Public health experts are trained to weigh the risks of disease against risks posed by vaccines. From this perspective, the expert committee charged with making vaccination recommendations to the CDC had trouble gauging the costs and benefits of smallpox vaccination. The likelihood of a smallpox attack was unknown, while the side effects of the vaccine could be fatal. As a consequence, the committee could not develop a recommendation for a vaccination program that was credible to the public health community. Moreover, the vaccination program faced resistance from public health workers—particularly hospital medical and nursing personnel—who were skeptical about the likelihood of a smallpox attack and who, in many cases, were reluctant to be enrolled in national security efforts. In the absence of convincing quantitative data about the program, they were unwilling to take the risks associated with vaccination. As a result of such technical and political conflicts, the vaccination program faltered.

A similar problem of normative conflict combined with political distrust has hindered federal efforts to build a nationwide health-monitoring system based on so-called syndromic surveillance, as Fearnley (2008a) has shown. Initially developed by local public health departments in response to an *E. coli* outbreak that went undetected by physicians, syndromic surveillance uses sources other than physicians' diagnostic reports—such as over-the-counter drug sales—to alert health authorities of possible disease outbreaks. In the late 1990s, national security experts began to explore the possibility of using this kind of system to detect a biological attack, given that physicians might not immediately recognize the symptoms caused by an unexpected or unknown pathogen. It soon became apparent, however, that national security officials and local public health experts had very different priorities in designing the system's algorithm—its mechanism for distinguishing normal from anomalous fluctuations in syndrome incidence. Rather than data quality and predictive value—emphasized by public health experts, who were accustomed to dealing with known, regularly occurring diseases—national security officials wanted a highly sensitive algorithm that would ensure the rapid detection of a wider range of potential disease outbreaks. Even though most of these signals of anomalous events would turn out to be insignificant, security officials believed that each must be treated as potentially catastrophic. In response, local public health experts argued that

they did not have the epidemiological capacity to investigate the high number of signals that would inevitably result, and that resources needed for existing health problems would be wasted chasing after false positives. As one early developer of syndromic surveillance put it, in a trenchant critique of the contradictions inherent to the federal program: "We have 80 percent of the nation covered but we really have nothing covered" (Fearnley 2008b, 80)—since, in the absence of basic health infrastructure, even a highly sophisticated disease surveillance program would be useless.

Global Health and Emergency Response

Let us now turn to recent conjunctures of global health and emergency response. Here again, we can see the way in which new problems—such as emerging infectious disease—provoke multiple responses and tensions among experts. Contemporary articulations of global health security typically focus on globalization processes as a key source of new biological threats, claiming that the intensifying global circulation of humans, animals, and agricultural products—as well as knowledge and technologies—encourages the spread of novel and dangerous new diseases. In response to such threats, global health security advocates argue, it is necessary to rethink regulation and responsibility: given the global scale of the threat and its multiple sources, it is often unclear who has regulatory jurisdiction or responsibility for managing a given disease event. A good example of such an articulation of global health comes from an influential 2003 RAND Corporation report, *The Global Threat of New and Reemerging Infectious Disease*. The report defines emerging disease as one among a number of new threats to security that "do not stem from the actions of clearly defined individual states but from diffuse issues that transcend sovereign borders and bear directly on the effects of increasing globalization that challenge extant frameworks for thinking about national and international security" (Brower and Chalk 2003, 3).

Proposed responses to this new "global threat" have come from diverse organizations, with equally varied agendas. Multilateral agencies such as WHO are developing new preparedness-based approaches to potential outbreaks of infectious disease; humanitarian organizations such as Médecins Sans Frontières focus on the immediate problem of reducing human suffering in the context of emergencies; and philanthropic ventures such as the Gates Foundation seek to manage global health threats by developing and disseminating new biomedical interventions. Despite many differences in their approaches, these various efforts share what we might call an emergency modality of intervention (Calhoun 2004). The emergency modality does not involve long-term intervention into the social and economic determinants of disease. Rather, it emphasizes practices such as rapid medical response, standardized protocols for managing global health crises, surveillance and reporting systems, or simple technological fixes like mosquito nets or antimicrobial drugs. Such emergency-management techniques are characterized by their mobility: at least in principle, they can be deployed anywhere, regardless of the distinctive characteristics of a given setting.

There are several reasons why global health organizations are often drawn to an emergency modality. One is that when cast as acute emergencies, situations may galvanize public attention and resources in a way that long-term problems do not. Another is that—at least from the vantage of first-order actors—measures focused on mitigating potential emergencies are easier to implement than longer-term structural interventions. As Nicholas King writes, short-term, technically focused "emergency" measures have "the advantage of immensely reducing the scale of intervention, from global political economy to laboratory investigation and information management" (King 2004, 64). And as Michael Barnett notes, such measures seek to avoid the complex entanglements implied by longer-term interventions in development and public health that "are political because they aspire to restructure underlying social relations" and therefore provoke controversy that purely medical interventions do not (Barnett 2008, 137).

For these reasons, even experts who understand that developmental issues such as poverty and deteriorating health infrastructure are critical sources of global disease risk may propose narrower technical measures given the difficulty of implementing

more ambitious schemes. In 1996, for example, molecular biologist Joshua Lederberg noted the connections between global inequality and threats to U.S. health security: "World health is indivisible, [and] we cannot satisfy our most parochial needs without attending to the health conditions of all the globe" (King 2004, 65). But the concrete interventions Lederberg advocated, such as networks of reference laboratories and global disease surveillance systems, were modest and, as he put it, "selfishly motivated"—that is, they were focused on protecting the United States from outbreaks rather than on addressing major problems of political and economic transformation in poorer parts of the world.

Medical anthropologist Daniel Halperin has pointed to the tendency of global health organizations to self-consciously avoid investment in basic public health infrastructures despite awareness that such investments would significantly reduce global infectious disease mortality. While billions of dollars have been earmarked to fight what are seen as disease emergencies, he notes, basic public health issues are often not of interest to major donors: "Shortages of food and basic health services like vaccinations, prenatal care and family planning contribute to large family size and high child and maternal mortality. Major donors like the President's Emergency Plan for AIDS Relief and the Global Fund to Fight AIDS, Tuberculosis and Malaria have not directly addressed such basic health issues. As the Global Fund's director acknowledged, '*We are not a global fund that funds local health*'" (Halperin 2008, emphasis added). In sum, given the temporal, political, and ethical structures of humanitarian biomedicine, issues of long-term care or endemic disease are difficult to assimilate into what Craig Calhoun (2008) calls the "emergency imaginary."

Critical studies of global health and security indicate that there are serious limitations to forms of intervention that focus only on emergency response—whether such response is based on a humanitarian imperative of sympathy for suffering strangers or on a security-based logic seeking to avert the spread of emergencies. As Calhoun has noted in an essay on the rise of "emergency" as a mode of justification for urgent global intervention, and on the limitations to such intervention: "There is a tension between responses rooted in simply providing care and responses linked to broader notions of human progress" (Calhoun 2008, 74). This tension relates to a difference in aims but also in forms of intervention: emergency response is acute, short-term, focused on alleviating what is conceived as a temporally circumscribed event; whereas "social" interventions—such as those associated with development policy—focus on transforming political-economic structures over the long term. Thus, in global health initiatives we find a contrast between possible modalities of intervention that parallels the one already described in U.S.-based biosecurity efforts: between acute emergency measures on the one hand and long-term approaches to health and welfare on the other. These approaches are based on distinct forms of technical reasoning that, in turn, suggest quite different ethical and political considerations—for instance, an attention to acute, short-term needs versus longer-term questions of development.

The emergency-management approach thus seeks to develop techniques for managing health emergencies that can work independently of political context and of socioeconomic conditions. This approach has become an increasingly central way of thinking about and intervening in global health threats. For example, Erin Koch has described the implementation of a TB-control program called DOTS (for Directly Observed Treatment, Short-Course) in post-Soviet Georgia. Part of the attraction of DOTS for nonstate funders is that it can seemingly be implemented without treating longer-term issues of social and economic development. Thus Koch quotes a doctor from a U.S.-based nongovernmental organization, who says: "[With DOTS] your TB program works under whatever conditions: in refugee camps, in prison, wherever. . . . If you do your program you can forget about the big social economic approach" (Koch 2008, 127). However, as Koch shows, the DOTS protocol for treatment of drug-resistant TB in "resource poor" settings like post-Soviet Georgia faces major hurdles. The economic situation has led to a massive deterioration of the public health infrastructure, making adherence to DOTS's strict diagnostic and treatment regimen nearly impossible. Compounding the problem in Georgia, the professional norms

of Soviet-trained doctors are incommensurable with the technical practices required by DOTS: most doctors in Georgia have been trained in very different methods for managing TB and are therefore unwilling or unable to comply with the protocol's directives. The implication is not necessarily that DOTS is the wrong answer, but that it cannot be successfully implemented without attention to a broader range of questions concerning social development and health infrastructure. As a number of critics have argued, global biomedical interventions such as DOTS can work only if they are accompanied by serious efforts to create local and sustainable forms of public health assistance (Farmer 2001; Nguyen 2004).

A common problem in emergency-oriented response is that highly mobile protocols or devices are implemented without attention to what is necessary for these protocols to function in concrete settings. In his research on Médecins Sans Frontières (MSF) Peter Redfield has analyzed the impressive logistical capabilities of the organization, which enable it to rapidly respond to health emergencies around the globe. Redfield focuses on the container-sized "humanitarian kit," a ready-made device, transported in shipping containers, that has proven efficacious in acute health emergencies for immediate intervention irrespective of place. But Redfield's analysis indicates that the strengths of the humanitarian kit and of the emergency modality more generally—their independence from social and political context—become weaknesses as soon as the organization seeks to intervene in longer-term problems. He points to the challenges posed by a new MSF initiative to provide sustained treatment to patients with HIV/AIDS in Uganda: to what extent can the kit—and the ostensibly apolitical humanitarian project it is associated with—be assimilated to chronic disease? Given its traditional focus on acute intervention, MSF struggles to provide the long-term care necessary to adequately treat HIV/AIDS. Nor is the organization equipped to deal with social and economic problems that are outside the scope of biomedical intervention. As Redfield writes: "Finding jobs and forging new relationships were matters of keen interest for members of patient support groups. . . . Although sympathetic, MSF was poorly equipped to respond to matters of poverty, unemployment and family expectations. The translation of treatment from rich to poor countries could not alter the structural imbalance between contexts in economic terms" (Redfield 2008, 164).

In their research on local responses to the threat of an avian influenza pandemic, Nick Bingham and Steve Hinchliffe describe a WHO-prescribed program of massive poultry culling in Cairo to mitigate the risk of H5N1 contagion. The program, based on an emergency-oriented protocol that was designed to be implemented automatically in the event of disease detection, is an example of the effort to develop a "standard, worldwide approach to dealing with 'out of place' biological entities" (Bingham and Hinchliffe 2008, 174). As in other standardized approaches, a lack of attention to the distinctive political and economic characteristics of the setting hinders the measures' potential effectiveness. Subsistence farmers' dependence on their poultry stocks for their livelihood, along with their lack of trust in the government, means that they are unlikely to comply with the mass culling directive: "Householders skeptical of the government's promises or level of compensation . . . successfully hid their birds, unwilling to let such valuable possessions be needlessly culled" (182). More broadly, the "contemporary project of worldwide integration and harmonization of biosecurity measures" exemplified by such mass culling programs "is fraught with risks however appealing it might sound" (191): it may fail to decrease the likelihood of a flu pandemic, while exacerbating problems of hunger and poverty. The uncertainties endemic to contemporary biosecurity threats such as avian flu point to the need to develop new ways of living with and managing the possibility of outbreaks that are more nuanced than current attempt efforts, which seek to achieve absolute security but do so at the expense of local well-being.

Health Security and Modernization Risks

The regulation of what Ulrich Beck (1992) calls "modernization risks" is another arena in which existing arrangements for managing health threats have been reconfigured. Beck argues

that increasing dependence on complex systems and technical innovations for health and welfare has "systematically produced" new risks. In the domain of health, such risks are linked to modernization processes such as expanding trade, industrial food production, or advances in the life sciences. Of course, while such problems are not new, the recent intensification of these processes has created new uncertainties about the forms of expertise appropriate to understand and mitigate these risks.

The area of food safety provides an illustration. Again, to simplify a complex story: the modernization of food production over the last century through industrial agriculture and food processing has, in the richest countries, provided access to a relatively abundant and predictable supply of food. But this increase in "food security" through industrialization and rationalization has consistently generated new risks, and, in response, new efforts to manage these risks. Thus, the first wave of food industrialization in the late nineteenth century led to abuses and scandals that were addressed in the United States by Progressive Era reforms, including the founding of the Food and Drug Administration and an expansion of the responsibilities of the U.S. Department of Agriculture.

For a number of reasons, however, the food safety risks that have emerged in recent decades challenge existing regulatory apparatuses. First, the intensifying globalization of industrial food production has posed new difficulties, such as the problem of maintaining quality control over global food and drug production chains, as indicated by recent scandals over the regulation of ingredients for pet food, toothpaste, and blood thinner that are imported from China. Second, emerging pathogens such as BSE (mad cow disease) and virulent new strains of *E. coli* have cast doubt on the adequacy of existing protocols and organizations for regulating food safety.[11] Third, intervention into agricultural production at the molecular level (e.g., genetically modified soy and corn) has led to disputes about proper forms of regulation, particularly in areas where risks are unknown.

Modernization risks are often associated with disputes over the authority of expert knowledge.[12] In attempts to increase health security, such disputes are characterized by technical disagreements over how to evaluate potential threats: cost-benefit analyses versus "precautionary" approaches that emphasize worst-case scenarios, for example, or different models for assessing the risk of certain experiments in the life sciences. In the area of food safety, one well-known case concerns the regulation of genetically modified organisms (GMOs). In the 1990s the European Union sought to ban the import of GMOs, influenced by a movement toward "precautionary" regulation that argued that new technologies could be restricted even in the absence of conclusive evidence about the risks they posed. The United States, which beginning in the 1980s instituted the use of cost-benefit analysis for addressing environmental and health risks, challenged the EU's policy in the World Trade Organization, insisting that without quantitative risk assessment, the ban constituted an illegal restraint on trade.[13]

Similar questions about risk assessment have played out within national regimes of regulation. For example, Frédéric Keck (2008) has described how the outbreak of BSE in France cast doubt on existing approaches to regulating food safety. In the French regulatory system, he notes, food safety had previously been the responsibility of veterinarians, who sought to manage animal diseases according to a rationality of prevention. But the scandals around BSE triggered a reproblematization of food safety. Human mortality had to be avoided at all costs, pushing the government to favor a precautionary approach that emphasized uncertain but potentially catastrophic risks. In response to the BSE crisis, the existing authority of veterinarians was supplanted by a new French Food Safety Agency in which physicians played a leading role.

While these conflicts appear in technical disputes about methods of risk assessment, they often have much broader social and economic consequences: the politics of expertise relates to questions about the distribution of social goods—and, as Beck (1992) points out, of social "bads." Arguably, the WHO consensus that avian flu can be traced to the interaction of wild bird migration and domestic poultry has meant that measures to counteract avian flu—particularly culling techniques—have disproportionately harmed

domestic growers and benefited large-scale poultry farms that international officials assume to be biosecure (Bingham and Hinchliffe 2008). An alternative hypothesis—that the spread of avian flu can be traced to the international circulation of poultry through legal or illegal trade, and to industrial poultry production and processing—has been largely ignored in international protocols to contain the disease, but would imply a very different set of measures.[14]

We also find conflicting frameworks for assessing and managing modernization risks in debates around regulation of the life sciences, particularly in light of concerns that new techniques of genetic manipulation could become instruments of bioterrorism. Debates about the regulation of the life sciences are not new. As scholars such as Susan Wright (1986) and Sheldon Krimsky (2005) have argued, current debates can be traced at least back to the 1970s, when civic and environmental groups in the United States raised questions about the social and ethical implications of scientific research at a number of levels. Biomedical scandals such as the Tuskegee Syphilis Experiment shaped an emergent field of bioethics, and the environmental movement drew attention to the risks of an accidental release of new pathogens created in laboratory environments (Jones 1989; Rothman 2003). As Wright (1986) has shown, molecular biologists managed to fend off these critiques, in part by shifting attention from the possibility of a pathogen release outside the lab to questions of laboratory safety. From this perspective, leading biologists argued, the most relevant measures were material controls in laboratories, and self-regulation by life scientists, who claimed that they were best able to judge the potential danger of experiments, thus excluding others from the assessment of risks.

More recently, however, this regime of material controls and self-regulation has been called into question. This is due in part to advances in techniques of genetic manipulation that have made it ever easier to engineer dangerous new pathogens. But it is also due to the increasing attention paid to bioterrorism, which has shifted the discussion about biosafety regulations. In the 1970s civic groups focused on whether well-meant scientific experiments could have unintended consequences. Today, by contrast, national security officials' focus is on the intentional malevolent use of scientific knowledge, a concern that has been voiced by some scientists, but that has predominantly come from the national security establishment, including think tanks such as the Center for Strategic and International Studies (CSIS).[15] From the national security perspective, advanced research in the life sciences may in the future make it possible to detect, characterize, and mitigate a bioterrorist attack. But such research may also introduce new threats. The question, for national security officials, is no longer one of material controls and self-regulation, but of regulating the production and circulation of dangerous knowledge on a global scale.

In this context, we find disputes over how to assess the threat posed by research in the life sciences. As Carlo Caduff (2008, 260) has noted, these conflicts often pit security officials, oriented to precautionary measures in the face of worst-case scenarios, against scientists, who defend norms of autonomy and free inquiry against what they perceive to be "provisional rules, vague obligations, and impossible demands [that] are systematically imposed on biomedical research in the name of national security." Underlying these explicit debates are often divergent assumptions about how scientific knowledge works, and what might make it "dangerous." Security officials tend to see scientific knowledge as easily abstracted from its context of production: once it is developed, they fear, it can be used anywhere to reproduce pathogenic organisms. But research in the social studies of science indicates that experiments considered "dangerous" may in fact depend on highly specific contexts that are difficult to reproduce (Vogel 2006, 2008).[16]

In her work on recent efforts to regulate potentially dangerous scientific knowledge, Vogel argues that most participants in discussions about such regulation assume that both the knowledge produced in advanced labs and the materials that they employ could easily be used elsewhere. As an example, she cites a report from CSIS that claims that if the results of research in the life sciences "are published openly, they become available to all—including those who may seek to use those results maliciously" (Epstein 2005). She also

points to a 2004 National Academy of Sciences report, *Biotechnology Research in an Age of Terrorism* (National Research Council 2004), which argued that "it is unrealistic to think that biological technologies . . . can somehow be isolated within the borders of a few countries" (Vogel 2008, 234). But on the basis of three case studies—the Soviet anthrax program, the 2003 poliovirus synthesis, and the 2003 synthesis of phiX bacteriophage—Vogel shows that, in fact, the replication of such feats of biological engineering is extremely challenging, depending on tacit knowledge and complex research apparatuses. She proposes an alternative approach to assessing "dangerous knowledge" not in terms of isolated materials and knowledge but in terms of the sociotechnical assemblies required to make experiments actually work.

Caduff (2008) has made a similar point in his study of the recent laboratory synthesis of the 1918 flu virus at the Centers for Disease Control, which was conducted under stringent biosafety controls. Media coverage focused on the possibility that the publication of results from such experiments could arm potential bioterrorists. Caduff notes that such concerns rested on a questionable model of pathogenicity. Viral pathogenicity is a property not of a virus in isolation, but of an interaction between the virus and the host—that is, human beings. Since humans are not, with respect to the 1918 virus, a naïve population (influenza viruses of the H1N1 subtype are still circulating today), it is unlikely that a release of the virus would have the same effects as it did ninety years ago.

Toward Critical, Reflexive Knowledge

Although there is a great sense of urgency to address biosecurity problems—and while impressive resources have been mobilized to do so—there is no consensus about how to conceptualize these threats, or about what the most appropriate measures are to deal with them. This situation is recognized by some of the more reflective observers in the fields in question here. Thus, as Richard Danzig (2003) has argued in the case of bioterrorism, despite the striking increase in funding for biodefense in the United States, there is still no "common conceptual framework" that might bring various efforts together and make it possible to assess their adequacy. Similarly, in a recent commentary on ambitious new initiatives to fight infectious disease on a global scale, Laurie Garrett (2007, 16) has noted that health leaders are just beginning to ask: "Who should lead the fight against disease? Who should pay for it? And what are the best strategies and tactics to adopt?"

There is no shortage of attempts to answer these questions. As we have seen, the intersection of public health and security is crowded with experts laying claim to authoritative knowledge about the most serious threats to health, and about the most appropriate responses to these threats. Political elites and policy experts make urgent calls to enact new biosecurity measures, whether for reasons of national security or global health, or in the name of a moral imperative to alleviate suffering. Meanwhile, technicians of various stripes, engaged in developing and implementing interventions, debate how to evaluate and improve existing measures. In analyzing the work of these first-order actors, recent work in the social studies of medicine has addressed the intersection of health and security in a different register. Such analyses do not advance claims about the urgency (or absence of urgency) of biological threats, nor do they offer direct solutions to biosecurity problems. Rather, they take these conflicting claims—and the disputatious claimants—as objects of inquiry.

A key insight of this line of research is that there are different kinds of biosecurity—that is, there are diverse ways that biosecurity can be problematized—and these different kinds of biosecurity entail not only different technical understandings of threats, but different underlying values.[17] From this vantage many of the disputes that emerge in the field are not simply matters of technical disagreement, of finding the right protocol, the right drug, or the right approach to risk assessment. Rather, these disputes revolve around questions that cannot be settled—or, indeed, even posed—by technical experts alone. One of the potential contributions of the approach we have outlined here, in this light, is to make these values—and tensions over conflicting values—

more explicit as objects of reflection (Collier and Lakoff 2008).[18]

Thus, culling programs imply a judgment about the value of human versus animal life: animals, it is assumed, can be sacrificed on a massive scale to avert deadly human disease, even if the risk of widespread outbreaks in humans is unknown (Keck 2008). Similarly, WHO protocols implicitly assume that the economic costs of culling domestic poultry in poor countries—a cost that falls disproportionately on the poor—is a "reasonable" price to pay for measures that may avert a global pandemic (Bingham and Hinchliffe 2008). But are such programs in fact reasonable, particularly when experts disagree about how effective culling will be in mitigating the risk of a pandemic? "Reasonable" will mean different things depending, in part, on the standard of rationality used in making assessments. But it will also depend on political and ethical judgments about how the costs and harms of biosecurity interventions can be justly distributed when the benefits are uncertain or highly diffused. Thus, disputes about vaccination programs are in part about technical risk assessment. But they are also disputes about the politics of risk that cannot be resolved in purely technical terms. How should known risks taken by first responders be weighed against the unknown benefits of the program for the national population in the event of a smallpox attack? How, as in the case of disease surveillance programs, should the resources of government be directed, and where does its responsibility lie? Is the primary imperative to respond through public health measures to known and regularly occurring disease? Or to take measures that may avert uncertain but catastrophic outbreaks? Such problems are most acute, perhaps, when the field of regulation is global. How to decide which measures to undertake in situations with tremendous needs, and limited resources?

These kinds of questions are crucial to address today, when responses to the problem of health and security are still taking shape. Doing so requires critical and reflexive knowledge that examines how technical efforts to increase biosecurity relate to the political and ethical challenges of what might be called "living with risk." Security—the freedom from fear or risk—always suggests an absolute demand; the demand for security has no inherent principle of limitation (Foucault 1997). There is no such thing as being too secure. Living with risk, by contrast, acknowledges a more complex calculus. It requires new forms of political and ethical reasoning that take into account questions that are often only implicit in discussions of biosecurity interventions. Making such questions explicit is one of the critical tasks ahead for researchers analyzing areas such as biosecurity, health preparedness, and the emergence of new biological threats.

Notes

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1. In this chapter we do not aim for a comprehensive survey of the social science research in these areas. Rather, we have selected a number of exemplary recent studies that engage with concrete settings in which debates about the intersection of health and security are taking place. This essay draws on, and extends, the analysis developed in the introduction to our edited volume *Biosecurity Interventions* (Lakoff and Collier 2008). Two important recent collections on public health and security in a global context are Bashford 2007 and Ali and Keil 2008.
2. For analyses of how early international health projects were linked to colonial administration, see Arnold 1993 and Anderson 2006.
3. For an analysis of assemblages as an object of critical social scientific inquiry, see Collier and Ong 2005 and Rabinow 2003.
4. For a detailed review of the developing concern with bioterrorism in the 1990s, see Wright 2006. As Wright argues, the very use of the term "weapons of mass destruction" to link nuclear weapons to biological weapons was a strategic act on the part of biodefense advocates. For a critical analysis of the logic of preemption in biodefense, see Cooper 2006.
5. It then declined slightly, to $5.37 billion, in 2006 (see Lam, Franco, and Schuler 2006). See Lentzos 2006 for a critical analysis of U.S. biosecurity measures.
6. For a new problematization to occur, Foucault writes, "something prior must have happened to introduce uncertainty, a loss of familiarity. That loss, that uncertainty is the result of difficulties in our previous way of understanding, acting, relating" (Foucault 1994).
7. For a discussion of "styles of reasoning" in scientific practice, see Hacking 2002.

8. For case histories of the rise of a "social" understanding of infectious disease, see Barnes 1995 and Delaporte 1986.
9. For discussions of preparedness and enactment, see Collier 2008; Collier and Lakoff 2008; Lakoff 2007.
10. See, for example, Cohen, Gould, and Sidel 1999.
11. For example, as Elizabeth Dunn writes, an outbreak of a deadly new strain of *E. coli* in the U.S. was "the product of a particular agro-industrial configuration which is highly concentrated and which produces an astronomical amount of food" (2007, 48).
12. Risk society, writes Beck (1992, 30), is characterized by "competing rationality claims, struggling for acceptance."
13. Sheila Jasanoff (2005) has argued that in these contests over the regulation of genetically modified organisms, one can see the characteristics of distinctive national "civic epistemologies." Other recent analyses have called into question the strict divide between European "precaution" and U.S. "risk assessment," and noted a significant shift in the European discussion away from precaution with the emergence of the "better regulation" agenda. See Weiner 2002 and Lofstedt 2004.
14. For a critical analysis of the migratory bird hypothesis of avian influenza transmission, see Gauthier-Clerc, Lebarbenchon, and Thomas 2007. See also Davis 2006.
15. See, for example, Garfinkel et al. 2007. For a critique, see Rabinow, Bennett, and Stavrianakis 2006.
16. For an empirical analysis of the working practices of regulators charged with overseeing biological research that poses new risks, see Lentzos 2006.
17. The line of research we have outlined here shares a concern with developing critical knowledge about contemporary biosecurity interventions. But it suggests that there is no single critical lens that would enable us to arrive at an overarching diagnosis of "biosecurity" today. In this sense, it diverges from critical studies that denounce what is claimed to be the increasing "securitization" or "militarization" of health. For basic texts on the "securitization," see Lipschutz 1995.
18. The proposition that critical analysis of technical expertise can yield insight into value orientations is a classic Weberian position (Weber 1949).

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