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# Introduction

Ingenuity, knowledge, and organization alter but cannot cancel humanity's vulnerability to invasion by parasitic forms of life. Infectious disease which antedated the emergence of humankind will last as long as humanity itself, and will surely remain, as it has been hitherto, one of the fundamental parameters and determinants of human history.

—William H. McNeill, *Plagues and Peoples* (1976)

In the post-Cold War era, policy-making communities are increasingly confronted with significant new challenges to the security and prosperity of the citizens over which they preside. Policy makers must now address diffuse threats to state interests, particularly scarcity of renewable resources, degradation of the environment, and international migration.<sup>1</sup> Indeed, the rise of “low politics” to the national security agenda of the modern state requires that international relations theorists design new “tools of analysis”: models that explain current developments (such as chronic state failure in sub-Saharan Africa) and that foreshadow dangers in order to guide policy. This book develops the idea that increasing levels of emerging and re-emerging infectious diseases (ERIDs) act as stressors on state capacity, undermining national prosperity and governance and in certain cases undermining national security.<sup>2</sup> Arguably, the primary *raison d'être* of international relations theory is to construct models that will assist in averting the premature loss of human life and productivity as a result of war. Indeed, as Thomas Hobbes claimed in *Leviathan*, it is the central function of the state to guarantee the physical safety of its citizens from both internal and external forms of predation. However, traditional concepts of security have ignored the greatest source of human misery and mortality: the microbial

penumbra that surrounds our species. I argue here that it is time to consider the additional form of ecological predation wherein the physical security and prosperity of a state's populace is directly threatened by the worldwide phenomena of emerging and re-emerging infectious disease.<sup>3</sup> Throughout this study, I shall use the following definition:

Emerging infectious diseases are those whose incidence in humans has increased during the last two decades or which threatens to increase in the near future. The term also applies to newly-appearing infectious diseases, or diseases that are spreading to new geographical areas—such as cholera in South America and yellow fever in Kenya. [Re-emerging infections are] diseases that were easily controlled by chemotherapy and antibiotics, but which have developed anti-microbial resistance.<sup>4</sup>

### **The Scope of the Problem**

Throughout recorded history, infectious disease has consistently accounted for the greatest proportion of human morbidity and mortality, surpassing war as the foremost threat to human life and prosperity.<sup>5</sup> Even in the era of modern medicine, states annually suffer much greater mortality and morbidity from infectious disease than from casualties incurred during inter-state and intra-state military conflict. According to the World Bank, of the 49,971,000 deaths recorded in 1990, infectious disease claimed 16,690,000 (34.4 percent), while war<sup>6</sup> killed 322,000 (0.64 percent).<sup>7</sup> This effect is even more pronounced in certain regions, sub-Saharan Africa in particular. According to UNAIDS, premature mortality in Africa from the HIV/AIDS pandemic is now much greater than war: 200,000 Africans died in warfare during 1998, while more than 2 million died of AIDS alone.<sup>8</sup> These statistics demonstrate the relative destruction wrought by disease when compared to deaths from military actions, and in terms of a ratio the deaths resulting from infectious disease compared to war are a significant 52:1 for this year. Infectious disease also accounts for more morbidity and mortality than any other single cause. According to the World Health Organization, of the 51 million worldwide deaths in 1993, ERIDs caused 16,445,000 (32.24 percent). By comparison, “motor and other-road vehicle accidents” accounted for 885,000 deaths (1.7 percent), and “homicide and violence” contributed to 303,000 deaths (0.6 percent).<sup>9</sup>

A recent report issued by the Centers for Disease Control and Prevention (an agency of the US government) warns that “the spectrum of infectious diseases is expanding, and many infectious diseases once thought to be controlled are increasing.”<sup>10</sup> Since 1975, at least 33 new pathogens have emerged to compromise the health of the human species. There is no vaccine, therapy, or cure for most of these new diseases, and the ability to anticipate, prevent or control them is extremely limited.<sup>11</sup> The best-known examples of emerging pathogens are the human immunodeficiency virus, the Ebola virus, and the bovine spongiform encephalopathy prion<sup>12</sup>; however, owing to rapid microbial evolution, old scourges such as tuberculosis, cholera, and malaria are becoming increasingly resistant to our anti-microbial armamentarium and are spreading.<sup>13</sup>

It must be understood that infectious disease is one of humanity’s oldest and direst enemies. Various diseases have wracked societies from time immemorial, resulting in panic, debilitation, and death. As such we must recognize that we are dealing with a very old adversary here, and it is rather our growing understanding of how pathogens interact with economic, political, and social factors that results in the sense of novelty in regards to the claim that infectious disease represents a threat to human development and security. Indeed, Thucydides, Gibbon, and Hippocrates recognized the enormous negative social and economic impact of infectious diseases on their respective societies. If infectious disease is seen as a “new” threat to political and economic stability it is largely because our species tends to exhibit the affliction of short generational memory.

Before the coming of the “golden age” of antibiotics and vaccines in the 1900s, diseases such as polio, smallpox, and tuberculosis were rampant around the world. These lethal and crippling diseases combined with cholera, malaria and plague to kill and disfigure millions. With the discovery of the cholera vibrio by the Prussian scientist Robert Koch in 1883, humanity began its scientific examination and war against infectious disease. Advances in public health have led to the general eradication of polio in the developed countries,<sup>14</sup> the near eradication of leprosy, and the selective incarceration of the various strains of variola (smallpox) within US and Russian military facilities.<sup>15</sup>

Throughout the twentieth century the human species witnessed successive triumphs over the microbial world, to the extent that prominent

experts in medicine frequently spoke about the eradication of infectious disease and the subsequent need to close public health programs and training facilities during the mid 1970s. This hubris led in turn to complacency, and funding for research to control the spread of malaria (and other vector-borne diseases<sup>16</sup>) was cut drastically from the mid 1970s on. Firms and governments subsequently curtailed funding for improved antimicrobial agents and the development of vaccines. In the minds of many, the enemy was vanquished and the medical world turned to focus its wealth of resources on other health scourges such as cancer, heart disease and genetically transmitted infirmities.

The rapid emergence of HIV/AIDS in the early 1980s served as a wake up call to populations in Europe, North America, and Africa. Here was an example of a “new” zoonosis<sup>17</sup> rapidly expanding outward from its animal reservoir in Africa to infect millions around the world by the end of the twentieth century. Similarly, many other viruses began to emerge in the mid 1970s, including pathogens causing hemorrhagic fevers such as the Ebola viruses (subtypes Zaire, Machupo, and Junin) and respiratory viruses such as hanta. New strains of bacteria such as legionella, *Escherichia coli* 0157 H7, and cholera (El Tor) also began to conquer new territory. Adding to the threat is the phenomenon of increasing drug resistance in malaria, tuberculosis, vancomycin-resistant enterococci, and methycillin-resistant *Staphylococcus aureus*. At the start of the new millennium the human species finds itself again facing the resurgent specter of disease, and burdened with new zoonoses (such as HIV) that mutate rapidly, such that vaccine development has failed repeatedly and complex and expensive therapies are required to extend the life span of individuals with HIV/AIDS in the developed countries.

Critics of “health security” argue that microbes and humanity have coexisted for millennia, and besides the collapse of a few empires and the deaths of billions, the human species has managed to survive. All of this is true, yet the human species finds itself in a very different situation now: individuals can travel around the world rapidly by airplane, and overpopulation and the growth of megacities have created entirely new “disease pools” that will allow new pathogens to emerge and flourish. This brave new world is also witnessing human-induced worldwide environmental destruction that results in the release of pathogens from their ancient

reservoirs in the core of rain forests, and where virulent new microbes result in the widespread destruction of aquatic life. Rapid worldwide changes may accelerate the diffusion, the lethality, and the resistance of the plethora of species within the microbial world, of which we have identified very few. While certain familiar diseases acquire resistance and conquer or reclaim territory within the human ecology, it is also likely that the natural processes of zoonotic transfer will persist and that new human pathogens will continue to emerge. The emergence of disease does not threaten the survival of the human species, yet it most certainly threatens the prosperity and stability of human societies and political structures.

In the spring of 1996 the World Health Organization declared a worldwide health emergency. The spread of ERIDs has become a crisis, and the WHO lacks the capacity to monitor, let alone contain, the various pandemics.<sup>18</sup>

### Trends in Disease Emergence

It is important to remain as objective as possible in this type of inquiry as much hyperbole exists on the subject of health security courtesy of Hollywood, some journalists, and fiction writers. We must ask: Is the prevalence of a particular infectious pathogen rising within a given state's population and also worldwide? Is this pathogen moving into new geographic regions or reclaiming lost territory, and is it affecting new demographics within given societies?<sup>19</sup> What regions (if any) are particularly vulnerable to this resurgence in infectious disease, and where are the greatest increases in prevalence taking place? At what rates are these pathogens expanding their territories, both demographic and geographic?

The worldwide proliferation of HIV/AIDS since the early 1980s has resulted in a staggering amount of human suffering, death, debilitation, and fear. From the earliest genetic traces of HIV proto-DNA, culled from the tissues of a Zairean male who died in 1954,<sup>20</sup> the pathogen has spread relentlessly outward from its Central African epicenter to the Americas and Western Europe; it is now spreading rapidly through South Asia, East Asia, and Eastern Europe. The pace of the HIV/AIDS pandemic<sup>21</sup> continues to accelerate, with 33.4 million people now infected, 5.8 million new HIV infections annually, and 2.5 million HIV-induced deaths in 1998.<sup>22</sup>

The pace of infection increased by 24 percent from 1995 to 1998. The HIV pandemic now rivals (in absolute magnitude of mortality) the greatest plagues of history, including the Black Death of Medieval Europe and the influenza pandemic of 1918 (each of which killed more than 20 million). As of 2000, the HIV pandemic has resulted in the infection of more than 53 million and claimed the lives of 18.8 million, with 2.8 million HIV/AIDS-induced deaths and 5.4 million new infections in 1999. The number of AIDS orphans now stands at an astonishing 13.2 million, most of them in sub-Saharan Africa.<sup>23</sup> The contagion is relentless and continues to spread rapidly through South and Southeast Asia, Eastern Europe, and Latin America.<sup>24</sup>

The epicenter of the HIV pandemic is sub-Saharan Africa, where many states are now reporting adult HIV seroprevalence<sup>25</sup> levels in excess of 10 percent. Indeed, South Africa, Kenya, Uganda, Zambia, Namibia, Swaziland, Botswana, and Zimbabwe all have adult seroprevalence levels ranging from 10 percent to 36 percent of the population.<sup>26</sup> Botswana, for example, saw national adult HIV seroprevalence rise from 10 percent in 1992 to 35.8 percent in 2000, an increase of approximately 360 percent over 8 years.<sup>27</sup> South Africa saw cases of HIV infection rise from 1.4 million in 1995 to 4 million in 2000, with 20 percent of the population now infected.<sup>28</sup> This represents an increase of HIV seroprevalence in the South African population of more than 200 percent in 3 years. Some regions within these states have even higher infection levels: HIV prevalence in KwaZulu-Natal (a province of South Africa) has now reached 30 percent,<sup>29</sup> and Francistown in Botswana reports that 43 percent of its citizens are infected.<sup>30</sup> Certain towns along the border between South Africa and Zimbabwe have HIV seroprevalence of approximately 70 percent.<sup>31</sup>

The pandemic is expanding into Eastern Europe at an ever-increasing pace. In 1998, Russian Minister of Health Tatyana Dmitriyeva predicted that more than a million Russians would be winfected with HIV by 2000.<sup>32</sup> Ukraine has also seen HIV incidence soar from a modest 44 cases in 1994 to an astonishing 240,000 cases as of mid 2000, with a national adult HIV seroprevalence rate of 1 percent.<sup>33</sup> India is also seeing HIV spread throughout its vast population at a rapacious pace. In 1994 AIDS was practically unheard of in India; now more than 1 percent of all pregnant women tested throughout the country are HIV positive and more

than 3.7 million Indians are now infected with HIV.<sup>34</sup> Disturbingly, by 1997 the epidemic was already firmly entrenched in regions of India such as Nagaland along the Burmese border (7.8 percent HIV seroprevalence), and nearby Manipur (over 10 percent HIV seroprevalence).<sup>35</sup> Indeed, except in the developed countries and in certain states such as Uganda and Thailand (which have seen some reduction in the rate of new infections), the HIV pandemic continues to expand at a rapid pace.

Tuberculosis (TB) has been making a steady comeback, and WHO declared the TB pandemic a world crisis in 1993. WHO estimates that “8.9 million people developed tuberculosis in 1995, bringing the total of sufferers to about 22 million, of whom about 3 million will have died in the same space of time.”<sup>36</sup> Furthermore, in the absence of increased effectiveness and availability of measure to control the disease, more than 30 million TB deaths and more than 90 million new TB infections are forecast to occur by the turn of the century.<sup>37</sup> Tuberculosis is making inroads into the industrialized nations, particularly Canada and the United States, where it infects disadvantaged urban and incarcerated populations and then spreads throughout society. The incidence of TB in the United States is climbing. For example, in the US, reported cases had declined from 84,300 in 1953 to 22,200 in 1984, a drop of approximately 4 percent per annum. However, from 1985 to 1993, the number of cases increased by a cumulative 14 percent.<sup>38</sup> Similarly, Zimbabwe has reported massive increases in TB incidence, from 5000 cases in 1986 to 35,000 in 1997.<sup>39</sup> In 1999 the demographer Murray Feschbach noted that the incidence of tuberculosis in Russia was increasing rapidly, and based on estimates provided by the Russian Ministry of the Interior he predicted that tuberculosis would result in the deaths of 1.75 million Russians per year by 2000.<sup>40</sup>

Malaria continues its relentless expansion into former regions of endemicity.<sup>41</sup> For example, in 1989 malaria claimed 100 lives in Zimbabwe while debilitating many thousands; by 1997 malaria was responsible for the deaths of 2800 in that country, an astonishing rate of increase for a disease that was once thought to be under control.<sup>42</sup> Indeed, the best available estimates project that malaria currently claims 5000 lives every day in Africa, approximately 1.8 million deaths a year.<sup>43</sup> Estimates put the worldwide total number of deaths from malaria at upwards of 2.7 million per year and note that malaria debilitates as many as 500 million people a year.<sup>44</sup> The

journalist Ellen Ruppel Shell claimed in 1997 that the incidence of malaria had increased by approximately 400 percent over the period 1992–1997 and noted that the disease had re-emerged in North America, moving from urban centers in California to Michigan, New York, and Toronto.<sup>45</sup>

Other pathogens are also re-emerging throughout the developing countries and are increasingly penetrating the porous borders of the industrialized states. For example, a new strain of cholera (designated 0139 El Tor) appeared in southeastern India in 1992. Now endemic throughout South and Southeast Asia, Africa, and South and Central America, it is spreading rapidly through Oceania. Moreover, mosquito-borne dengue fever has re-established itself in Central America and Mexico and is currently making inroads into the southern United States, particularly in Florida, Louisiana, and Texas.

Meanwhile, familiar pathogens continue to exact their toll on humanity with relentless vigor. For example, acute lower respiratory infections kill nearly 4 million children a year, and diarrheal pathogens such as adenovirus and rotavirus kill nearly 3 million infants a year. Viral hepatitis is another global scourge: at least 350 million people are chronic carriers of the hepatitis B virus, and another 100 million harbor the hepatitis C virus. According to WHO projections, at least 25 percent of these carriers will die of related liver disease.<sup>46</sup> Worse, many of the 10 million new cases of cancer diagnosed in 1995 were caused by viruses, bacteria, and parasites. The WHO calculates that at least 15 percent of all new cancer cases (1.5 million) result from exposure to infectious agents, and this percentage of disease-induced cancer mortality is estimated to increase as our knowledge of both infectious disease and cancer advances. New evidence is linking many other supposedly chronic or genetic diseases, such as heart disease and multiple sclerosis, to common infectious agents (chlamydia and herpes, respectively) that promote long-term disease processes within human hosts.<sup>47</sup> If cancer, heart disease, and multiple sclerosis are in fact induced by pathogens, the world's burden of infectious disease may be far greater than was once thought.

It is relatively easy to see that infectious disease is an agent of death throughout the developing countries. It is not often apparent that infection-induced mortality also has been on the rise in the developed countries. The United States, which is arguably the only superpower and which

has enormous state capacity,<sup>48</sup> has seen a steady increase in mortality from infectious disease. In 1979 there were 15,360 deaths from infectious disease; in 1995 there were 77,128<sup>49</sup>—an increase of 502 percent.

### The State of Knowledge on Health Security

The spread of lethal infections such as HIV and tuberculosis throughout significantly affected societies is comparable to the effects of a slow-acting neutron bomb that eliminates a large proportion of the population while leaving the infrastructure intact. The destruction of the population base of a country is a profound threat to that country's security, yet the literature on health security is particularly thin, likely because the concept is novel. The few works that do exist have succeeded in raising interest in the issue area and have spurred deeper analysis of the hypothesis that pathogens present a threat to national security and development.

In *The Coming Plague*,<sup>50</sup> Laurie Garrett claims that the worldwide proliferation of diseases poses a threat to the national security of the United States. Garrett reiterates this point in "The return of infectious disease,"<sup>51</sup> wherein she attempts to clarify the particular threat that ERIDs pose to the global interests and the national security of the United States. Garrett's claims have some inherent common sense, and she offers numerous examples of worldwide disease emergence. Her works are notable for having brought the issue of health security to the attention of the policy community and for having raised the possibility that the return of infectious diseases might constitute a significant threat to US interests.

Similarly, Dennis Pirages expounds on the power of infectious disease as a threat to state security and foreign policy interests. In a report titled *Microsecurity: Disease Organisms and Human Well-Being*, Pirages provides a blueprint for further investigations in the realm of health security and provides interesting anecdotal evidence that the resurgence of infectious disease is directly related to human-induced changes in the biosphere. This pioneering work (which had little to build upon) stands as a reasonable first attempt to clarify the issues, and it suggests many avenues for further research:

Infectious diseases are potentially the largest threat to human security lurking in the post-Cold War world. Emerging from the Cold-War era, it is understandably

difficult to reprogram security thinking to take account of non-military threats. But a new focus that included microsecurity issues could lead to interesting cost-benefit thinking. Winning the war against new and reemerging infectious diseases requires both long-term and immediate changes. Educating people to think about this struggle with microbes in an evolutionary way is the ultimate solution. In the short term, policymakers need to understand the potential seriousness of the problem and reallocate resources accordingly.<sup>52</sup>

Though Pirages's and Garrett's theories are both intuitively persuasive, they fail to address whether the resurgence of disease will have different impacts on different societies. Do ERIDs constitute a direct or an indirect threat to states and/or societies, and do they threaten some regions of the world more than others? Recent advances have also been made by historians who have traced the effects of warfare and those of various pathogens on societies across the centuries. Though the evidence is largely (if not entirely) anecdotal, historians have done a good job of examining the effects of infectious disease on the societies in question over time.

As William McNeill proposed in *Plagues and Peoples*, microbes have been relentless adversaries of humanity and of human societies since time immemorial. Current anthropological evidence suggests that the expansion and collapse of various societies throughout history may have resulted in part from the transmission of lethal and/or debilitating pathogens. Thucydides's account of the eventual fall of Athens during the Peloponnesian Wars pays particular attention to the devastating effect that "the plague" had on Athenian governance, and by extension on the Athenian war effort:

The bodies of the dying were heaped one on top of the other, and half-dead creatures could be seen staggering about in the streets or flocking around the fountains in their desire for water. For the catastrophe was so overwhelming that men, not knowing what would happen next to them, became indifferent to every rule of religion or law. Athens owed to the plague the beginnings of a state of unprecedented lawlessness. Seeing how quick and abrupt were the changes of fortune . . . people now began openly to venture on acts of self-indulgence which before then they used to keep in the dark. As for what is called honor, no one showed himself willing to abide by its laws, so doubtful was it whether one would survive to enjoy the name for it. No fear of god or law of man had a restraining influence. As for the gods, it seemed to be the same thing whether one worshipped them or not, when one saw the good and the bad dying indiscriminately. As for offences against human law, no one expected to live long enough to be brought to trial and punished.<sup>53</sup>

McNeill argued that the collapse of the Byzantine Roman Empire in the sixth century A.D. resulted from the "plague of Justinian," which was a

consequence of the merging of two previously isolated disease “pools” via Asian trade routes (the Silk Road).<sup>54</sup> The Roman historian Gibbon recounts the devastation wrought by the plague as follows:

I only find that, during three months, five and at length ten thousand persons died each day at Constantinople; and many cities of the East were left vacant, and that in several districts of Italy the harvest and the vintage withered on the ground. The triple scourges of war, pestilence and famine afflicted the subjects of Justinian; and his reign is disgraced by a visible decrease of the human species which has never been regained in some of the fairest countries of the globe.<sup>55</sup>

The destruction of feudalism may have also resulted in large part from the recurrent waves of bubonic and pneumonic plague (i.e., the Black Death) that repeatedly swept Europe in the fourteenth and fifteenth centuries. Specifically, the continuing recrudescence of the plague throughout medieval Europe resulted in periodic waves of mass mortality that had a significant negative effect on the legitimacy of pre-existing structures of authority, particularly the Roman Catholic Church. As it became increasingly apparent that fealty to the Church had no effect on whether one succumbed to the plague, the legitimacy (and relevance) of the Church was called into question by Martin Luther and others. The resulting Protestant rebellion against the Catholic Church resulted in the Thirty Years’ War and culminated in the Peace of Westphalia, which saw the establishment of the sovereign state as an empirical entity. In a very real sense, then, the Black Death was a progenitor of the entire system of modern sovereign states as we know it.<sup>56</sup> Alfred Crosby and William Denevan have constructed detailed accounts of how the merging of the American and European disease pools permitted the rapid and absolute conquest of the Americas by relatively modest European military forces. This demographic catastrophe, which derived from the importation of smallpox and other “civilized” diseases to an immunologically vulnerable population, resulted in the collapse of the Aztec and Incan empires and in centuries of subjugation of the Amerindian peoples.<sup>57</sup> McNeill puts the Amerindian population at the beginning of the conquest at approximately 100 million. “Starting from such levels,” he writes,

population decay was catastrophic. By 1568, less than fifty years from the time Cortez inaugurated epidemiological as well as other exchanges between Amerindian and European populations, the population of Mexico had shrunk to about three million, . . . about one tenth of what had been there when Cortez landed.

Decay continued, though at a reduced rate, for another fifty years. Population reached a low point of about 1.6 million by 1620. [Such a disaster] carries with it drastic psychological and cultural consequences. Faith in established institutions and beliefs cannot easily withstand such disaster; skills and knowledge disappear. Labor shortage and economic regression was another obvious concomitant.<sup>58</sup>

Infectious diseases continued to play a role in the evolution of political entities. During the American Revolutionary War of 1776, smallpox helped to prevent the armies of the United States (then led by Benedict Arnold) from capturing Canada. Michael Oldstone writes:

During the Revolutionary War, the American colonial government sent an army to wrest Canada away from the English. Having captured Montreal, the colonial army, superior in number, marched on to engage in the conquest of Quebec City. But smallpox entered their ranks. The decimated American army, soon after burying their dead in mass graves, retreated in disorder from Quebec.<sup>59</sup>

Oldstone notes that 5500 of the 10,000 American troops originally involved in the campaign developed smallpox and died, which effectively nullified the American offensive and allowed Britain to maintain its stronghold in British North America.<sup>60</sup> Infectious diseases also occasionally caused significant governance problems for the fledgling United States, as became evident during Philadelphia's yellow fever epidemic of 1793:

Philadelphia had suffered a previous yellow fever plague in 1762, when a hundred had died, but now thousands were dying. Thomas Jefferson wrote from Philadelphia to James Madison in Virginia, telling about the fever, how everyone who could was fleeing and how one of every three stricken had died. Alexander Hamilton, the secretary of the Treasury, came down with the fever. He left town, but when he was refused entry to New York City, he turned to upstate New York. . . . There he and his wife were obliged to stay under armed guard until their clothing and baggage had been burned, their servants and carriage disinfected. Clerks in the departments of the federal government could not be kept at their desks. In the Treasury Department, six clerks got yellow fever and five others fled to New York; three sickened in the Post Office and seven officers in the Customs Service. Government papers were locked up in closed houses when the clerks left. By September, the American government came to a standstill.<sup>61</sup>

This abbreviated overview of the possible historical impact of infectious disease on the currents of history is merely intended to demonstrate to the reader the profound relationship between forces of the natural world, such as pathogens, and the evolution of human societies. It is not meant to imply that diseases have been the major force in defining the outcomes of all human history<sup>62</sup>; that would bring us to the shores of biological deter-

minism, a conceptual model unlikely to take us very far. Yet it is fascinating to note that biological forces may, in fact, have had a significant effect on the broader outlines of human history, and will likely continue to do so as disease continues to proliferate around the world.

## Effects of Infectious Disease on the State

### Disease and Economic Productivity

The negative effects of infectious disease in the domain of economic productivity include reductions in gross domestic product (GDP) and in government expenditure per capita, decreases in worker productivity, labor shortages and increased absenteeism, higher costs imposed on household units (particularly on the poor), reductions in per capita income, reduced savings, and increases in income inequalities within a society that may in turn generate increased governance problems. Disease also generates disincentives to invest in the education of children, impedes the settlement of marginal regions and the development of natural resources, negatively affects tourism, and results in the embargoing of infected goods. The significant negative association between increasing disease levels and the economic prosperity of affected societies may lead to increases in absolute and relative economic deprivation in affected states. These effects, taken together, demonstrate how the worldwide resurgence of infectious disease is likely to produce negative outcomes for the prosperity of states.

### Disease and Governance

The effects of a succession of epidemics upon a state are not measurable in mortalities alone. Whenever pestilences have attained particularly terrifying proportions, their secondary consequences have been much more far-reaching and disorganizing than anything that could have resulted from the mere numerical reduction of the population. Panic bred social and moral disorganization; farms were abandoned, and there was shortage of food; famine led to displacement of populations, to revolution, to civil war, and, in some instances, to fanatical religious movements which contributed to profound spiritual and political transformations.

—Hans Zinsser, *Rats, Lice, and History*, pp. 128–129

At the unit level, in the domain of governance, high disease incidence undermines the capacity of political leaders and of their bureaucracies to

govern effectively as the infection of government personnel results in the debilitation and death of skilled administrators whose job it is to oversee the day-to-day operations of governance. Disease-induced mortality in human-capital-intensive institutions generates *institutional fragility* that tends to undermine the stability of a nascent democratic society. In Zimbabwe, an estimated 30 percent of urban adults in the 19–45 age group are HIV positive, and at least three government ministers have succumbed to AIDS in recent years.<sup>63</sup> Huguette Labelle of the Canadian International Development Agency estimated that as of 1999 about half the members of Zambia's armed forces and police forces were HIV positive.<sup>64</sup> When these individuals perish, there will be enormous negative repercussions for governance, with a likely corresponding rise in crime, civil unrest, and low-intensity violence.

#### **Possible Systems-Level Effects**

Disease exerts a negative effect on state capacity at the unit level that may produce pernicious outcomes at the systems level. Within the domain of economics, as disease produces a significant drag on the economies of affected countries, we may see chronic underdevelopment, which may in turn exert a net drag on world trade and impair prosperity. In all likelihood, owing to the nature of spiral dynamics inherent in the relationship between infectious disease and state capacity, countries with low initial state capacity will suffer greater losses over time from increasing prevalence of infectious disease within their populations. Owing to this negative spiral effect, disease's negative influence on the economic development of states may exacerbate the economic divide between developed and developing countries. Furthermore, the negative effects of infectious disease are not confined to the developing countries. At the systems level, trade goods from disease-affected regions (for example, British beef and Hong Kong chickens) may be subject to international embargo. As infectious agents continue to emerge and re-emerge, and as agricultural crops and animal stocks become increasingly infested, we should expect that presumably infected trade goods from affected states will be embargoed, tourism to affected regions may decline, and economic damage to affected states will likely intensify.

This volume demonstrates that increasing levels of disease correlate with a decline in state capacity. As state capacity declines, and as

pathogen-induced deprivation and increasing demands upon the state increase, we may see an attendant increase in the incidence of chronic sub-state violence and state failure. State failure frequently produces chaos in affected regions as neighboring states seal their borders to prevent the massive influx of disease-infected refugee populations. Adjacent states may also seek to fill the power vacuum and may seize valued territory from the collapsing state, prompting other proximate states to do the same and so exacerbating regional security dilemmas. An example of this is the wide-ranging conflict in Central Africa, where the collapse of governance in Zaire (and continuing insurgency in the successor state, the Democratic Republic of the Congo) has generated a wider conflict wherein the mercenary armies of Uganda and Rwanda seek to topple the fragile government in Kinshasa. Conversely, military forces from Angola, Namibia, Zimbabwe, Sudan, and Chad have been deployed to the Democratic Republic of the Congo to crush the rebels and their masters in Kigali and Kampala.<sup>65</sup> Indeed, the chaos in Central Africa was so great in early 2000 that Ugandan and Rwandan forces turned on each other in their quest to dominate the ungoverned regions of the eastern DRC.

As the incidence and the lethality of diseases increase, deprivation will mount and state capacity will decline, generating more stress and greater demands on government structures. Thus, as disease prevalence increases and the geographical range of pathogens expands, the number of failing states may rise, necessitating increased humanitarian intervention by UN security forces to maintain order in affected regions. As we have seen from recent experiences in sub-Saharan Africa, the UN is unlikely to have a lasting effect in restoring order to areas where disease incidence and lethality remain high.

It is necessary to differentiate between *outbreak events* and *attrition processes*,<sup>66</sup> as these two phenomena may have dissimilar but significant effects at both the unit level and the systems level. Examples of classic outbreak scenarios are the bubonic plague in Surat, India (autumn 1994) and the Ebola epidemic in Zaire (spring and summer 1995). These outbreaks generated worldwide fear and panic, mass out-migrations, military quarantines to contain the exodus of infected persons, and economic damage. Attrition epidemics (HIV, tuberculosis, malaria) do not generate as much fear and out-migration as “outbreak” events, but they typically result in

greater actual human morbidity and mortality and in significant long-term economic and social erosion. The distinction between these two types of phenomena is important because outbreak events and attrition processes result in somewhat different outcomes, depending on how much fear and deprivation are generated by the pathogens in question.

Disease emergence must be understood not as a singular isolated “event” but rather as a part of biological evolutionary processes taking place at the macro level. The concept of emergence as a process is important because “outbreak events” such as the plague in Surat and Ebola in Zaire are really just disease manifestations that rise above the lower threshold of our perceptions long enough to alarm us momentarily. It is best to think of these “outbreaks” as akin to upward spikes on a stock market graph. While the spikes penetrate the threshold of our perception and then retreat, the process of disease evolution and emergence continues to grow inexorably. Eventually, disease emergence, prevalence, and lethality may cross a crisis threshold, and we may be forced to take serious action to reduce the microbial threat. The only question is whether we will still have the ingenuity we will need to deal with the problem when we realize its significance and its magnitude. At the moment, the world has the wealth and the social and technical ingenuity to check the spread of disease and to limit the destruction and misery that most infectious diseases cause. Yet dealing with the proliferation of so many diverse pathogenic agents will require enormous amounts of political will, international cooperation, continued regime consolidation, and a significant redistribution of resources from the developed to the developing countries.

### **Case Studies**

At this point, let us briefly examine several cases wherein outbreaks or resurgences of infectious diseases have contributed to economic damage and problems of governance, both at the intra-state level and at the inter-state level. One preliminary conclusion we can draw from the emergence of V-CJD (a lethal new variant of Creutzfeldt-Jacob disease), Ebola, HIV, and plague is that people are extremely risk averse when it comes to the emergence of new pathogens, and that emergence tends to generate paranoia, hysteria, and xenophobia that may affect the foreign policy of a state

by impairing decision making. The recent epidemic of pneumonic plague (*Yersina pestis*) in western India during the autumn of 1994 gives an idea of how the psychological effects of infectious disease (in the form of outbreak events) may affect both an afflicted state's *state capacity* and its relations with its neighbors.

The very rumor of plague in Surat prompted a frenetic exodus from the city of more than 300,000 refugees, who might then have carried the pestilence with them to Bombay, to Calcutta, and as far as New Delhi.<sup>67</sup> Out of fear, Pakistan, Bangladesh, Nepal, and China rapidly closed their borders to both trade and travel from India, and some of those countries went so far as to restrict mail from India. As the plague spread, concern mounted. International travel to and trade with India became increasingly restricted. On September 22, 1994, the Bombay stock exchange plunged, and soon thereafter many countries began to restrict imports from India, placing impounded goods in quarantine or turning them back at the border.<sup>68</sup> As the crisis worsened, the Indian army was called in to enforce a quarantine on the affected area in western India, and doctors who had fled Surat were forced to return to work under a threat of legal prosecution by the government. In the aftermath of the epidemic (which killed 56 people), the Indian government was notified by the Centers for Disease Control in Atlanta that the *Yersina pestis* bacillus was an unknown and presumably new strain. This information was interpreted by Indian authorities as "unusual," and they promptly accused a group of rebel militants (the Ultras) of procuring the bacillus from a pathogen-manufacturing facility in Kazakhstan with the object of manufacturing an epidemic in India. This paranoia on the part of Indian officials resulted in the transfer of the inquest of the epidemic from public health authorities to the Department of Defense.<sup>69</sup> Beyond the acrimony that the plague fostered between India and its Islamic neighbors, the economic toll of the plague has been estimated at a minimum of \$1.8 billion in lost revenue from exports and tourism.<sup>70</sup> While the loss of \$1.8 billion may seem trivial, to a developing state like India it represents a serious blow to the economy with negative repercussions throughout numerous sectors. As we can see in the Surat event and the continuing BSE scare in Europe, infectious disease and the irrational behavior that it generates may worsen relationships between states and/or cultures.<sup>71</sup>

The continuing concern in Europe over BSE (“Mad Cow Disease”) has resulted in the embargo of many beef-derived British products and has dictated the culling of a significant proportion of the UK’s beef stocks. And the BSE scare has frightened the British population. Scientists talk about the possibility that thousands of Britons are infected with a new variant of Creutzfeldt-Jacob disease (human BSE), and in 1996 the UK’s European partners summarily banned the import of British beef (in violation of EU trade law).<sup>72</sup> The European Union’s ban on British beef products was lifted in 2000, but France continues to defy the EU by maintaining its ban on British beef products. At the beginning of 2001, relations between London and Paris remain strained over the persistent inability of these states to address the BSE issue and to limit the spread of the BSE prion pathogen in cattle.

## Synopsis

In chapter 1, I summarize the concepts surrounding the emergence and the re-emergence of infectious disease, name the pathogens that are currently making inroads against our best anti-microbial defenses, discuss theories of microbial evolution that are relevant to my study, set forth my research method, and detail the various data sources and collection techniques I used. In addition, I examine the important roles of facilitating variables such as war, famine, poverty, international migration, and misuse of medical technologies as “disease amplifiers” in altering the flow of viral traffic. I then lay out the model I propose to test in order to determine whether infectious disease has a measurable effect on state capacity over time.

In chapter 2, I present the empirical findings of my quantitative analysis of the relationship between ERIDs and state capacity at the national, regional, and worldwide levels. I also examine the worldwide correlations between the various individual indicators of state capacity and ERIDs, in order to note the strength of the correlations and scale of the effects. Most important, I demonstrate the empirical existence of an asymmetrical feedback loop between population health and state capacity, with population health exhibiting a greater downstream effect on state capacity than vice versa.

In chapter 3, I analyze the effects of infectious disease on economic productivity at the state level. Here I combine empirical epidemiological data with economic indicators, and, using basic techniques of statistical anal-

ysis, I note the deleterious effect of disease on economic productivity. The profound negative effect of ERIDs on societal prosperity at the individual and macro levels will result in increasing relative and/or absolute deprivation in severely affected countries. In this chapter I employ process-tracing techniques to track the likely relations between health and development at the microeconomic, sectoral, and macroeconomic levels of a state's economy. I also demonstrate how the proliferation of ERIDs may compromise the economic development and productivity of a state, generate absolute economic deprivation at the micro level, and (in a severely affected country) increase the economic gap between the wealthy and the poor.

In chapter 4, I examine the recent emergence of infectious diseases as a security issue for the world policy community. I consider the claim that infectious disease constitutes a verifiable threat to national security and state power. I also address how the continuing emergence and proliferation of pathogens may affect regional political stability, peacekeeping, and international regimes, briefly examine certain political barriers to effective response at both the national and the international level, and examine the feasibility of locating the threat of infectious disease as a security issue within the pre-existing paradigm of environmental security.

In chapter 5, I employ process-tracing techniques to delineate the probable causal relationships among various facets of worldwide environmental change (climate change, extreme weather, patterns of land use, etc.) and the resulting likely effects on the prevalence and lethality of microorganisms and on the distribution and infectivity of their vectors (e.g., mosquitoes and rats). The balance of the evidence presented in this chapter demonstrates that humanity's increasing negative impact on the biosphere will accelerate the emergence of pathogens into the human ecology while simultaneously altering the distribution of currently known pathogenic organisms. Continuing worldwide change may also alter the infectivity and the lethality of both known and emerging microorganisms.

In the conclusion, I examine and analyze the evidence I gathered for this project, present my findings, develop policy recommendations based on these findings for dissemination to the foreign policy and international development communities, and delineate pathways for further scientific inquiry into the associations between the biological and political realms.